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ABSTRACT

The recent emphasis on career education accentuates the problem of transforming and organizing information work domain into information that can be applied to educational problems. A comprehensive taxonomy of human work and accompanying measurement devices suitable for educational purposes is needed. This report describes a systematic procedure for describing, comparing, and grouping jobs and occupations for educational purposes. Emphasis is on the ergometric approach, with its application of psychometrics to the study of human work. As the first phase in a program to promote articulation between the educational and work domains, the Occupation Analysis Inventory provides: (1) conceptual structure, (2) work elements with widespread applicability, (3) tests in the cognitive, psychomotor, and affective domains, and (4) scaling procedures providing for quantitative job descriptions. (BH)

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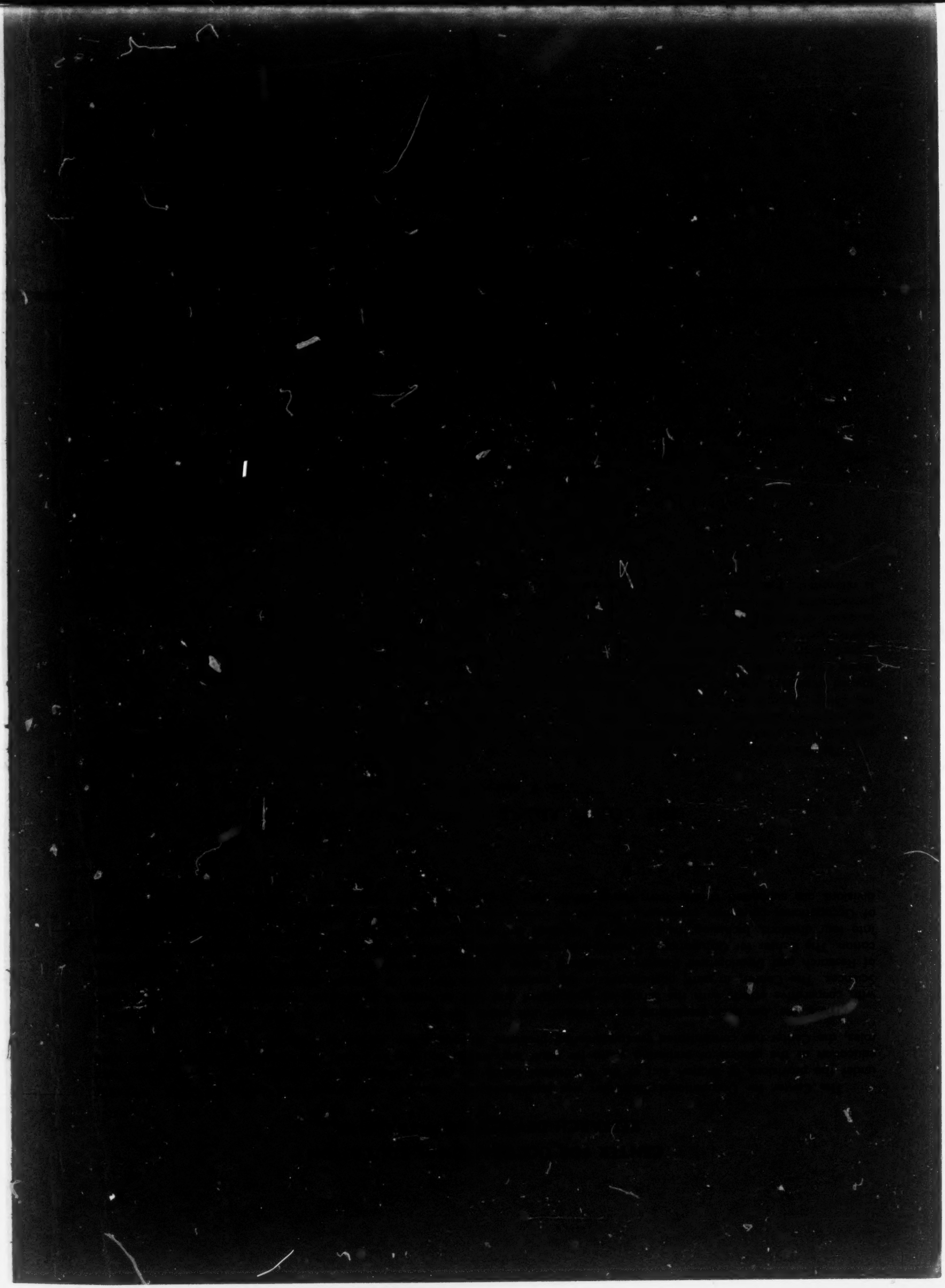

THE DEVELOPMENT OF THE OCCUPATION ANALYSIS INVENTORY:

An "Ergometric" Approach to an Educational Problem

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Report No. 3 of the Ergometric Research and Development Series

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PREFACE

This report, the third in the Ergometric Research and Development Series of the Center for Occupational Education, presents the Occupation Analysis Inventory and chronicles its development.

I do not wish to dwell here on the OAI *per se* and the intellectual input into its construction. Writing the 622 items, for example, is no mean accomplishment. In my opinion, the significant aspects of the report are the view of man as an information processing organism and the delineation of the potential dimensions of work in human terms. So often we forget that work is the invention of man. Inventors, composers, designers, and even athletes design and invent the requirements for work. Of course, the ultimate constraints are dictated by the capabilities of the human organism to adapt and adopt. These capabilities are, however, unknown quantities. For example, the contortions that are displayed by today's superstar basketball player would undoubtedly startle James Naismith if he were to return to life. While these "moves" are transmitted from generation to generation of basketball players, each learning the skills from the other, each invents new permutations and combinations of skills.

The description of work by the OAI quite properly places the information process in the work context, but it goes even beyond the rationale and development to form a basis for translating the characteristics of work into the educational context, and for providing a basis for interface between the individual and the object of his work environment.

The Center is indebted to Dr. Cunningham and his associates for their intensive work and study in the preparation of this report. Appreciation is expressed to Dr. J. R. Clary, Jr., Executive Director of the State Advisory Council for Vocational Education, for his candid review prior to publication. The Center also thanks Mrs. Joyce Pollard and Mrs. Olive Maynard for typing the manuscript, and the entire technical and editorial staff for their contributions to the production of this monograph.

John K. Coster
Director

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INTRODUCTION

The U. S. Office of Education has recently introduced the concept of career education and designated it an area of high priority (Marland, 1971). Although there is some debate over the definition of career education, the term and the explanations accompanying it suggest a developmental approach to occupational education. The emphasis placed upon the world of work in career education is reflected by the Office of Education's "school-based" model which, as presently conceived, centers around 15 occupational clusters (National School Public Relations Association, 1971).

This recent interest in career education brings to the fore a problem that has been recognized for some time in occupational education; namely, that we do not have an adequate basis for transforming and organizing information from the work domain into information that can be applied to educational problems (Cunningham, 1969, 1971). Yet, if the purpose of education is to prepare the student for the adult society, it is incumbent upon that system to establish relationships between the tasks and conditions imposed upon the student in the educational setting and those which he is likely to encounter upon leaving this environment. Articulation between the educational and work domains should be a major concern of career education.

The problem of establishing linkages between the tasks and conditions comprising educational programs and the task and contextual structure of the work domain arises in connection with a number of concepts and practices in occupational education. In dealing with the concept of cluster curricula, for example, we must ask: What are the characteristics by which occupations are to be described, compared, and classified for educational purposes; and, even assuming we could establish valid clusters of similar occupations without first defining a set of variables (or descriptors) for classification purposes, how would we then determine what common denominators should be incorporated into the curricula? Questions related to the work structure also arise in occupational guidance and placement. Among these are how occupational information should be organized for guidance purposes; how the resulting occupational categories (or clusters) can best be described to facilitate career exploration and decision making; and what the basic requirements of these categories are in terms of such measured human attributes as aptitudes and interests.

These and other questions concerning relationships between the educational and work domains point to the need for a comprehensive taxonomy of human work and accompanying measurement devices and procedures suitable for educational purposes. Such a taxonomic system should be organized into a hierarchical structure ranging from occupational categories (clusters) and descriptors to task categories and descriptors, thus providing analytical capability at different levels of complexity, depending upon particular research and development needs. Ultimately, the taxonomy should account for developmental progressions

in the acquisition of task capabilities, beginning with classes of relatively simple tasks learned at early ages and extending through classes of complex and advanced occupational tasks. Thus, vertical linkages might be established between classes of tasks at different developmental levels such that, for a specified class of tasks, certain prerequisite or antecedent classes of tasks could be identified (Gagné, 1962a; Cunningham, 1969, 1971). Under this scheme, sets of descriptors would be defined for purposes of developing and describing different levels of the taxonomy. In addition, the dimensions and categories in the taxonomy would be linked to various human attributes (i.e., behavioral potentials in relation to specified classes of tasks and conditions) for which tests have been developed in the cognitive, affective, and psychomotor domains.

The efforts of many investigators over a number of years will be required to develop a comprehensive taxonomic system of this kind; such long-range efforts must be undertaken if future educational needs are to be met. Societal exigencies demand, however, that a practicable (albeit imperfect) scheme for describing the characteristics of work and occupations be made almost immediately available for educational use; for unless some framework is established for the new field of "career education," it is doubtful that the full potential of this concept will be realized. Instead, a variety of programs could emerge under this rubric which would interrelate neither vertically nor horizontally--that is, neither in terms of systematic developmental progressions nor in such a manner as to insure comprehensive and integrated coverage of the work domain at specified developmental levels.

The present paper concerns the development of a systematic procedure for describing, comparing, and grouping jobs and occupations for educational purposes--a procedure which, it is hoped, will promote articulation between the educational system and the world of work.

PURPOSE

In an earlier paper, Cunningham (1971) defined the field of "ergometrics" and proposed that the technology in this field be applied to taxonomic and other problems in occupational education. "Ergometrics" was defined as:

> . . . the application of psychometric principles and procedures to the study of human work. ("Erg" derives from the Greek word "ergon," meaning work.) This field of investigation would draw from theories and principles of human behavior, as well as from established procedures in psychological measurement and job analysis. It would deal with at least four basic kinds of problems: (1) the definition, quantification, and classification of work variables; (2) the establishment of relationships between work variables and existing measures of human attributes (i.e., tests in the cognitive, psychomotor, and affective domains); (3) the development of measures of work-related human attributes, or behavioral potentials (such as vocational ability tests and interest scales); and (4) the study of the nature of the relationships among various work-related variables. Accordingly, research in ergometrics, like any other field of research, would involve theory building, measurement, classification, and hypothesis testing (Cunningham, 1971, pp. 12-13).

It was suggested that ergometric procedures be used in transforming and organizing information from the work domain into information that could be applied to such educational problems as curriculum development and evaluation, the development of career guidance systems, the development of occupationally related tests, and educational planning.

In the same paper it was noted that the development of a taxonomic scheme requires the definition of a set of variables by which the phenomena under study can be described, compared, and classified. Among the variables that have been used to describe jobs and occupations are: (1) definitions of basic human attributes (e.g., aptitudes, perceptual-motor abilities, and interests), (2) knowledge and skill definitions, (3) activity statements applicable to restricted ranges of jobs, and (4) activity statements applicable to jobs in general (Cunningham, 1971). Although all of these categories of descriptors have some application to educational problems, the circumstances and limitations under which they can be used vary. Of particular interest to the present investigators is the last category of variables: activity statements applicable to a broad occupational spectrum. Such variables have the advantage of describing jobs in terms of concrete, observable events and yet being suitable for general descriptive and classificatory purposes. Moreover, it is methodologically possible to link this type of activity statement to defined human attributes (e.g., aptitudes), such that the attribute requirements of jobs can be estimated from ratings on activity variables (McCormick, Cunningham, and Thornton, 1967;

McCormick, Jeanneret, and Mecham, 1969a). This procedures produces descriptions both in terms of (a) classes of activities and conditions existing in the job and (b) the human attribute requirements of the job. A descriptive procedure based on general activity statements could be used in comparing and grouping a wide range of occupations for educational purposes, and in establishing average activity (or work-dimension) and attribute-requirement profiles for the resulting occupational clusters.

The present paper describes the development of an Occupation Analysis Inventory (OAI) containing work-activity and condition statements (descriptors) applicable to the general population of jobs and occupations. An extensive review of the literature on work analysis relevant to educational problems (Cunningham, 1971) revealed a need for a descriptive and classificatory scheme possessing the following characteristics: (1) a conceptual structure based on theories and constructs of human behavior; (2) work elements (descriptions of activities and conditions) that are general enough to be applicable to a wide variety of jobs and occupations, and yet specific and concrete enough to have curricular and other educational implications; (3) an established linkage between the work elements in the system and human dimensions for which there are standardized measures (i.e., tests in the cognitive, psychomotor, and affective domains); and (4) a set of scaling procedures providing for quantitative descriptions of jobs and occupations. The Occupation Analysis Inventory was designed in accordance with these specifications. The development of this instrument is conceived as the first phase in an ergometric R and D program directed toward the problem of articulation between the educational and work domains.

GENERAL RATIONALE FOR INSTRUMENT DEVELOPMENT

In considering the problem of defining variables applicable to the general population of jobs, McCormick (1964; McCormick, Jeanneret, and Mecham, 1969a) proposed the concept of "worker-oriented" versus "job-oriented" descriptors. According to this concept, worker-oriented statements describe jobs in terms of the worker's behavior (and the conditions to which the worker is exposed), whereas job-oriented statements refer primarily to what is accomplished in jobs. Thus, worker-oriented statements are more suitable for describing a wide variety of jobs, since these variables, as contrasted with job-oriented statements, are relatively independent of the specific technological aspects of jobs.[1] McCormick and his associates have applied the worker-oriented concept in the development and successive improvement of a series of job-analysis inventories. The latest of these instruments, the Position Analysis Questionnaire (McCormick, Jeanneret, and Mecham, 1969b), is the product of over a decade of research. The Position Analysis Questionnaire (PAQ) contains 210 items (worker-oriented descriptors), divided into sections corresponding to the components of an information-processing paradigm and six basic rating scales which are assigned to the various items. This instrument was designed primarily for two purposes: (1) for estimating the human attribute requirements of jobs through an analytic procedure employing a basic set of work dimensions for which human requirements have been established; and (2) for use in job evaluation. There is evidence supporting the validity of the PAQ for both of these purposes, and McCormick and other investigators are currently collecting further data which should add to this support.

It appeared to the present investigators that the "ergometric" concepts and procedures developed by McCormick and others could be used in the development of a descriptive and classificatory scheme which might ultimately prove applicable to educational problems, particularly curriculum development. The Occupation Analysis Inventory (OAI) is intended as an initial step in that direction. This instrument represents an effort to achieve as much descriptive specificity (or content loading) as possible, while retaining applicability to the entire occupational spectrum. The OAI is thus conceived as an instrument which pushes the limits of general applicability; that is, an instrument which falls near a specificity-generality threshold separating general descriptive devices from devices designed for restricted categories of jobs and occupations. Accordingly, the OAI contains almost three times as many items as the Position Analysis Questionnaire, and some (though not all) of these items are more "job-oriented," or technologically loaded, than the typical PAQ item.

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[1] Allen (1969) has presented evidence in support of a worker- versus job-oriented continuum of verbs, although his findings also suggest that this continuum is complex rather than unidimensional.

Regarding the problem of systematically describing, comparing, and classifying jobs, McCormick has proposed that jobs be characterized in terms of their levels on quantitative work dimensions (McCormick, 1964; McCormick, Jeanneret, and Mecham, 1969a). Thus, according to McCormick, jobs can be profiled in terms of work-dimension scores in a manner analogous to the profiling of people on test scores. This analogy has implications beyond the fact that quantitative profiles can be derived for both jobs and people. Work-dimensions represent classes of tasks and conditions as these occur in jobs, whereas scores on most tests represent either the individual's level of proficiency on specified classes of tasks (as measured by aptitude and achievement tests) or his tendency to approach or avoid specified classes of tasks, conditions, and outcomes (as measured by interest and need inventories) (Cunningham, 1971). Conceivably, then, both jobs and people could be measured on the same dimensions--dimensions representing classes of tasks and conditions.

With the above mentioned relationship between work-dimension and test profiles in mind--and with the intention of attaining as much descriptive specificity as possible in a generally applicable job-analysis instrument--the present investigators decided that the Occupation Analysis Inventory should describe jobs with a somewhat higher degree of specificity than Altman's (1966) general vocational capability tests describe people but with appreciably less specificity than found in most occupational proficiency tests. Altman defines general vocational capabilities as ". . . skills and/or knowledges having relevance to a variety of occupations which go beyond the basic academic tools of reading, writing, arithmetic, and understanding of general science." (1966, pp. 5-6) He has operationally defined this concept in a set of general vocational capability tests, falling into six major categories along a hypothetical hardware-to-people continuum. A modification of this hardware-to-people scheme (involving an expansion to 10 categories) was incorporated into the structure of the Occupation Analysis Inventory. Other frameworks embodied in the OAI include J. P. Guilford's (1966, 1967, 1971) structure of intellect, E. A. Fleishman's (1964) perceptual-motor factor structure, the functional occupational classification structure in the Dictionary of Occupational Titles (Fine, 1958, 1969; U. S. Department of Labor, 1965), and certain technological classifications adapted from several sources.

Figure 1 indicates the level of specificity at which the OAI is intended to describe jobs, in relation to different levels of task capabilities that are sometimes used to characterize people. This figure depicts a developmental hierarchy of human capabilities, ranging from the cognitive and psychomotor abilities acquired in early childhood (pre-school) to competencies associated with specific jobs. Although the OAI work elements (items) and dimensions (factors) were developed to describe jobs with somewhat greater specificity than Altman's general vocational capability tests describe people, these elements and dimensions have been linked to specified aptitudes and vocational capabilities such that ratings of a job on the OAI can be transformed into estimates of that job's aptitude and vocational-capability

requirements (see p. 17 for a more complete explanation). Thus, the OAI can be used to obtain quantitative descriptions of jobs in terms of: (a) classes of work activities and conditions, at the level of specificity indicated in Figure 1; (b) requirements for Altman's general vocational capabilities, at a somewhat lower level of specificity; and (c) requirements for general cognitive and psychomotor abilities (aptitudes). The organization of the Occupation Analysis Inventory is discussed in greater detail in the following paragraphs.

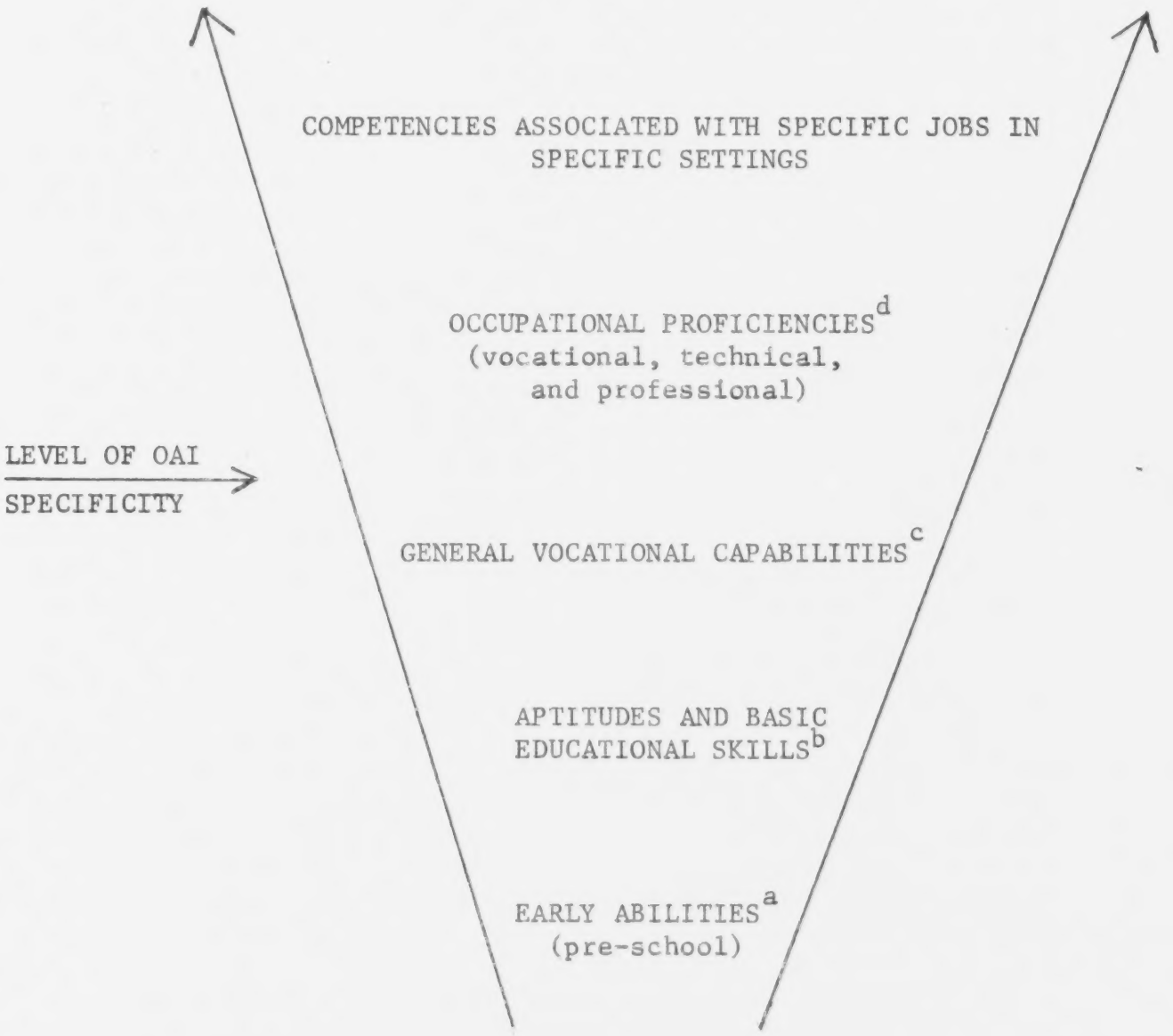
COMPETENCIES ASSOCIATED WITH SPECIFIC JOBS IN SPECIFIC SETTINGS
OCCUPATIONAL PROFICIENCIES[d] (vocational, technical, and professional)
LEVEL OF OAI SPECIFICITY
GENERAL VOCATIONAL CAPABILITIES[c]
APTITUDES AND BASIC EDUCATIONAL SKILLS[b]
EARLY ABILITIES[a] (pre-school)

Figure 1. A hierarchy of human capabilities, ranging from basic and general to increasingly specific and complex task capabilities (cf. Gagné, 1962a). The horizontal arrow indicates the approximate level of specificity at which the OAI is intended to describe jobs, in relation to levels in the human capability hierarchy. (Adapted from Cunningham, 1969)

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[a]The term "early abilities" refers to cognitive and perceptual-motor abilities acquired before the child has learned to read; these are

CONSTRUCTION OF THE OCCUPATION ANALYSIS INVENTORY

The first step in the development of the OAI involved the construction of a framework within which work elements (or descriptors) could be generated. (The term "work element" refers to a statement describing a work variable--activity or condition--on which jobs can be rated.) It was decided that the overall structure of the OAI should conform to the conception of man as an information-processing system which transforms information input into prescribed outcomes. This conception has found increasing acceptance among psychologists during recent years, as exemplified in Guilford's (1967) structure of intellect and in Fleishman's (1969) definition of abilities as ". . . capacities for processing different kinds of information." (p. 350) Moreover, several investigators have recognized the potential utility of an information-processing approach to task and job analysis (Gagné, 1962b; McCormick, Jeanneret, and Mecham, 1969a, 1969b; Miller, 1962; Stolurow, 1964a, 1964b). Accordingly, the major divisions of the OAI correspond to the components of the closed-loop information processing system shown in Figure 2. The components in this system include: (1) Information Input; (2) Mediational (or mental) Processes; (3) Behavioral Output; (4) Work Goals, the anticipated outcomes of work; and (5) Work Context, which sets the stage

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measured by such devices as the Bayley Infant Scales of Development, the Gesell Development Schedules, the Stanford-Binet, the Boehm Test of Basic Concepts, and the Kindergarten Evaluation of Learning Potential (see Anastasi, 1968 and Cronbach, 1970).

[b]The term "aptitudes," as used in this figure, refers to basic cognitive and perceptual-motor abilities as defined by such investigators as Thurstone (1938), French et al. (1963), Guilford (1967), Fleishman (1964), and Vernon (1960). The term "basic educational skills" refers to level of achievement in such areas as reading, arithmetic, spelling and language usage, work-study skills, and general science; these are measured by such devices as the California Achievement Tests, the Iowa Tests of Educational Development, and the Sequential Tests of Educational Progress (see Anastasi, 1968).

[c]"General vocational capabilities" are defined as ". . . skills and/or knowledges having relevance to a variety of occupations which go beyond the basic academic tools of reading, writing, arithmetic, and understanding of general science." (Altman, 1966, pp. 5-6) A set of general vocational capability tests has been developed for research purposes at the American Institutes for Research (Altman, 1966).

[d]"Occupational proficiencies" are skills and knowledges associated with specific occupations and measured by trade tests, professional licensing and certification examinations, various civil service examinations, etc. (see Anastasi, 1968).

in which work activities occur. These major divisions are further subdivided, as shown in Table 1 and described in the sections which follow. A complete copy of the OAI appears in the Appendix (pp. 39-173). The various types of subdivisions are defined on pp. 40-44; the reader should see these definitions before proceeding to the next section of the report.

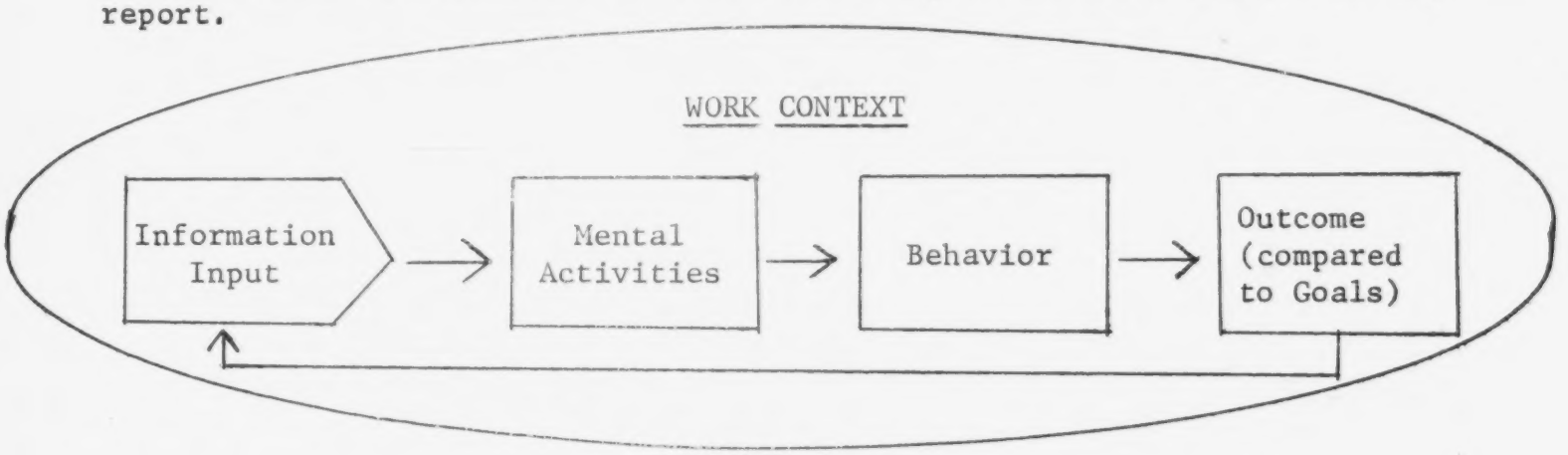

Figure 2. Paradigm for the Occupation Analysis Inventory (OAI)

Table 1. Subdivisions of the Occupation Analysis Inventory (OAI)

A. INFORMATION RECEIVED

INFORMATION CONTENT
- Mechanical information
- Electrical and electronic information
- Spatial/structural information
- Materials information
- Environmental information
- Art/decorative information
- Biological/health information
- Semantic/symbolic information
- Business/sales information
- Information about people and animals

SENSORY CHANNEL

B. MENTAL ACTIVITIES
- Figural information processing
- Sumbolic information processing
- Semantic information processing
- Behavioral information processing
- Educational and experiential requirements

Table 1. (continued)

C. WORK BEHAVIOR

PHYSICAL WORK BEHAVIOR
- Tool, Machine, and Equipment Usage
  - Non-powered hand tools
  - Portable powered tools/equipment
  - Portable non-powered equipment
  - Stationary machines and equipment
  - Mechanized equipment
  - Setting/control devices
  - Measurement, layout, and scientific devices
- General Physical Requirements and Work Activities
  - General physical requirements
  - Work activities involving materials, objects, and machines
  - Work activities involving humans and animals
- Objects/Materials Acted Upon
  - Living objects
  - Crude materials
  - Processed materials
  - Finished parts and components
  - Finished products

REPRESENTATIONAL WORK BEHAVIOR
- Representational devices
- Written and spoken verbal communications
- Symbolic and numerical communications
- Miscellaneous aspects of communication
- Data processing activities

INTERPERSONAL WORK BEHAVIOR
- Interpersonal activities
- Person types

D. WORK GOALS

- Mechanical objectives
- Electrical objectives
- Objectives accomplished through material/object arrangement or modification
- Environmental/earth objectives
- Art/decorative objectives
- Biological/health objectives
- Semantic/symbolic objectives
- Business/organizational objectives
- Objectives related to people and animals

E. WORK CONTEXT

- Physical context
- Job structure
- Miscellaneous conditions and requirements
- Social context
- Incentives

Items Dealing with Information Received (Category A of the OAI)

The OAI items subsumed under Information Received (Category A, pp. 45-70) are divided into two subcategories, Information Content and Sensory Channel.

The subcategory titled Information Content deals with various kinds of information used by incumbents in performing their jobs (see p. 46). This subcategory is, in turn, divided into 10 groups of items under the following headings: (1) Mechanical, (2) Electrical, (3) Spatial/Structural, (4) Materials, (5) Environment, (6) Art/Decorations, (7) Biological/Health, (8) Semantic/Symbolic, (9) Business/Sales, and (10) People/Animals. (These groups are defined in the OAI, pp. 46-66.) These 10 classes of information were adapted from Altman's (1966) six content categories, which are ordered along a hypothesized hardware-to-people continuum. Although Altman's content categories were defined on an *a priori* basis, there is some empirical support for them: there is a rather consistent tendency for tests developed within these categories to intercorrelate more highly as the distance between them decreases on the hardware-to-people continuum.

Each of the 10 content groups is, in turn, subdivided into two sets of items, under the headings of Direct Information and Indirect Information. Direct information is obtained from direct, on-the-scene contact with or observation of physical objects and events (devices, materials, situations, people, etc.); indirect information, on the other hand, is received in verbal (written or oral) or symbolic form (see p. 46). The direct and indirect information categories were derived by collapsing Guilford's (1966, 1967) four content categories. Direct Information includes Guilford's Figural and Behavioral information, and Indirect Information subsumes his Semantic and Symbolic categories. Thus, the Information Content items in the OAI are organized in terms of an adapted cross-classification between the Altman and Guilford content categories.

The second subcategory, Sensory Channel, contains items dealing with the various sensory processes, i.e., mechanisms through which information is received (see pp. 67-70).

Items Dealing with Mental Activities (Category B of the OAI)

The Mental Activities category is divided into five item groups: (1) Figural Information Processing, (2) Symbolic Information Processing, (3) Semantic Information Processing, (4) Behavioral Information Processing, and (5) Educational and Experiential Requirements. The first four groups correspond to the content categories in Guilford's structure of intellect and are, with the exception of Behavioral Information

Processing, further subdivided in accordance with Guilford's five processes, including: (1) Cognition ("Comprehension" in the OAI); (2) Memory; (3) Convergent Production ("Problem-Solving" in the OAI); (4) Divergent Production ("Productivity" or "Ingenuity" in the OAI); and (5) Evaluation (omitted under Semantic Information Processing in the OAI). The individual items correspond, for the most part, to hypothesized intellectual factors which (a) have some empirical support (based on research conducted by Guilford or others), (b) seem meaningful for job-analysis purposes, and (c) appear to be translatable into reasonably reliable job-rating items. The Guilford (1967) correspondents of the OAI Mental Activities items are indicated in Table 2. In addition, Table 2 includes a number of cognitive factors identified by French et al. (1963), in cases where these correspond to OAI items. In most cases, there are tests available to measure the mental process defined by an OAI item.

The fifth group of items under Mental Activities deals with required education and work-related experience.

Table 2. Factors Corresponding to the OAI Mental Activities Items

OAI Items		Guilford Factors[a]	ETS Factors[b]
1m	Object Recognition	CFU	Cs
2m	Object Discovery	NFT	Cf
3m	Spatial Orientation	CFS	S
4m	Object Visualization	CFT	Vz
5m	Visual Tracing	CFI	Ss
6m	Figural Memory	MFU,C,R,S,T	--
7m	Figural Problem-Solving	NFS,T,I	--
8m	Figural Ingenuity	DFU,C,S,T,I	Xa
9m	Form Perception	EFU	P
10m	Aesthetic Judgment	EFU,C,R,S,T	--
11m	Spelling	CSU	--
12m	Comprehension of Symbolic Procedures	CSR,S,T,I	--
13m	Symbolic Induction	CSS	I
14m	Symbolic Memory	MSU,C,R,S	Ma,Ms
15m	Numerical Computation	NSI	N
16m	Symbolic Deduction	NSI	--
17m	Symbolic Operations Sequencing	NSS	--

Table 2. (continued)

OAI Items	Guilford Factors[a]	ETS Factors[b]
18m Word Fluency	DSU	FU
19m Symbolic Generation	DSI	--
20m Clerical Perception	ESU	P
21m Evaluation of Symbolic Procedures	ESR,S,T,I	--
22m Verbal Comprehension	CMU,EMU	V
23m Problem Comprehension	CMS	R
24m Problem Detection	CMI	Sep
25m Memory of Unitary Ideas	MMU	--
26m Memory of Idea Sequences	MMS	--
27m Memory of Associated Ideas	MMI	--
28m Deductive Reasoning	NMI,EMI	Rs
29m Plan Ordering	NMS	--
30m Idea Originality	DMT	O
31m Idea Production	DMU	Fi
32m Idea Expression	DMS	Fe
33m Idea Flexibility	DMC	Xs
34m Plan Elaboration	DMI	--
35m Associational Fluency	DMR	Fa
36m Verbal Construction	(Complex)	--
37m Person Perception	CBU,CBI	--
38m Group Perception	CBS,CBI	--

[a]These factors are defined in The Nature of Human Intelligence (Guilford, 1967).

[b]These factors were defined in the Manual for Kit of Reference Tests for Cognitive Factors (French et al., 1963).

Items Dealing with Behavioral Output (Category C of the OAI)

Category C of the OAI (pp. 92-139 of Appendix) concerns classes of activities required by workers in their jobs. This category is divided into three major subcategories: (1) Physical Work Behavior, (2) Representational Work Behavior, and (3) Interpersonal Work Behavior.

The subcategory titled Physical Work Behavior is further divided into three sections: (1) Tool, Machine, and Equipment Usage; (2) General Physical Requirements and Work Activities; and (3) Objects/Materials Acted Upon. The section dealing with Tool, Machine, and Equipment Usage contains seven groups of items, ranging from small devices (such as non-powered hand tools and measurement devices) to mechanized equipment. The first four of these item groups are subdivided in terms of tool and equipment functions; the fifth group, Mechanized Equipment, is divided into three broad classes of functions; the sixth group deals with four classes of Setting/Control Devices; and the seventh group is composed of three classes--Measurement, Layout, and Scientific Devices.

The section titled General Physical Requirements and Work Activities contains three groups of items. The first group, General Physical Requirements, deals with basic physical capabilities and activities required by jobs and includes items corresponding to a number of Fleishman's (1964) perceptual-motor factors, as well as several items concerned with basic physical activities and positions (e.g., walking, climbing, running, kneeling). The second group of items--Work Activities Involving Materials, Objects, and Machines--describes various classes of activities in which job incumbents work with physical objects. The last group of items, titled Work Activities Involving Humans and Animals, concerns classes of physical actions directed toward people or animals.

The last section under Physical Work Behavior concerns classes of Objects/Materials Acted Upon (see pp. 117-122). This section is divided into item groups falling along a continuum rating from Living Objects and Crude Materials to Finished Products.

The second major subcategory under Work Behavior (Category C) is titled Representational Work Behavior. This subcategory contains 39 items, organized into the following five groups: (1) Representational Devices, (2) Written and Spoken Verbal Communications, (3) Symbolic and Numerical Communications, (4) Miscellaneous Aspects of Communication, and (5) Data Processing Activities. With the possible exception of Representational Devices, the forenamed classes of activities would fall primarily within Guilford's Semantic and Symbolic content categories.

The third and last subcategory under Work Behavior is Interpersonal Work Behavior, which contains 34 items dealing with the types of personal contacts required of the job incumbent. These items fall into two groups--Interpersonal Activities and Person Types--and are rather heavily loaded with Guilford's Behavioral content.

Items Dealing with Work Goals (Category D of the OAI)

Category D, Work Goals, deals with the objectives (or prescribed outcomes) of work; that is, with the conditions which the worker is responsible for bringing about or maintaining, either through his own work behavior or through direct, on-the-scene supervision of the work of others. The Work Goals category is divided into nine item groups, as follows: (1) Mechanical Objectives, (2) Electrical Objectives, (3) Objectives Accomplished through Material/Object Arrangement or Modification, (4) Environmental/Earth Objectives, (5) Art/Decorative Objectives, (6) Biological/Health Objectives, (7) Semantic/Symbolic Objectives, (8) Business/Organizational Objectives, and (9) Objectives Related to People and Animals. The foregoing classes of Work Goals were adapted from Altman's (1966) six content categories, and, with the exception of (3), they parallel the Information Content groups in Category A. The third group--Objectives Accomplished through Material/Object Arrangement or Modification--combines the Spatial/Structural and Materials groups employed in Category A.

Items Dealing with Work Context (Category E of the OAI)

Work Context, the last item category in the OAI, deals with miscellaneous aspects of the work situation or environment. The classes of variables defined under this category are presented in Figure 2 (p. 9) by the area in the ellipse falling outside of the closed-loop paradigm. Thus, the context variables are considered to comprise the stage, or milieu, in which work activities occur, rather than entering directly into the information flow depicted in Figure 2.

Category E is subdivided into five item groups: (1) Physical Context, dealing with various physical aspects of the work environment; (2) Job Structure, dealing with the extent to which the incumbent's activities and schedule are restricted, or prescribed, by the nature of the job; (3) Miscellaneous Conditions and Requirements, containing descriptions of various kinds of work conditions and responsibilities (e.g., novel situations, rush situations, safety consequences of errors); (4) Social Context; and (5) Incentives, factors which the worker associates with satisfaction or reward and strives to attain. The Incentives items are organized according to Alderfer's (1969) E.R.G. (existence, relatedness, and growth) theory, and they correspond rather closely to the needs in the Minnesota Importance Questionnaire (Gay et al., 1971).

The OAI Scales

The scales for the OAI items are defined in the Appendix (see pp. 42-44). There are three general scales: (1) a Significance Scale, (2) an Extent Scale, and (3) an Applicability Scale. In addition, special scales were constructed for a limited number of items, in cases where none of the general scales was considered appropriate.

The Significance Scale is a modification of a scale developed by Hemphill (1959) which requires the rater to judge the significance of a particular work element as part of the job in question. This scale requires the rater to "consider and weigh" such factors as the importance of the work element to the job, its frequency of occurrence in the job, and the amount of time it requires. Despite the complexity of the Significance Scale, there is evidence to support its reliability. In a study comparing several frequently used job-rating scales, Cragun and McCormick (1967) found that Hemphill's scale had the highest reliability.

The Extent Scale--a modification of a scale developed for the Position Analysis Questionnaire (McCormick, Jeanneret, and Mecham, 1969b)--was employed in the OAI in instances where the Significance Scale seemed inappropriate. The Extent Scale is used primarily in the Work Context category, although it is applied in several cases in the Work Behavior category (Items 18r-21r).

The Applicability Scale was used in instances where, for either intrinsic or practical reasons, a dichotomous discrimination appeared appropriate. This scale appears only in the Work Context category and is applied to such items as Safety Apparel (21c), Uniform (24c), Day Hours (38c), etc.

Special scales were constructed for individual OAI items in instances where none of the general scales seemed appropriate. Such scales, though relatively infrequent, appear in all of the major OAI categories except Work Context.

RESEARCH INVOLVING THE OAI

Subsequent to the construction of the OAI, data were gathered for further development and validation of the instrument. The research phase of the OAI project is outlined below.

Human Attribute Requirements of OAI Work Elements

As mentioned earlier, the work elements in the proposed taxonomy should be linked to human dimensions for which there are standardized measures (i.e., tests in the cognitive, psychomotor, and affective domains). A scheme in which such linkages existed would provide the capability for describing and comparing jobs and occupations (and possibly tasks) not only in terms of observable activities and conditions, but also in terms of the measurable human attributes required. Moreover, evidence for the feasibility of establishing linkages between work elements (and dimensions) and defined human attributes can be found in the work of McCormick and his associates (McCormick, Cunningham, and Thornton, 1967; Mecham and McCormick, 1969a, 1969b).[2]

Accordingly, one part of the OAI project employed McCormick's procedures in establishing requirement profiles for the OAI work elements (items) on 103 defined human attributes in the cognitive, affective, and psychomotor domains. This part of the project is reported in a Center for Occupational Education Research Monograph titled Human Attribute Requirements of Work Elements: Further Development of the Occupation Analysis Inventory (Neeb, Cunningham, and Pass, 1971).

Systematically Derived Work Dimensions

Because of the large number of work elements (items) in the OAI and the redundancy among these elements (as reflected by their intercorrelations), this instrument would be a rather unwieldy descriptive scheme if its items were not combined into a more manageable number of work dimensions representing basic classes of activities and conditions. Although the various a priori classes (subcategories, sections, and groups) within which the OAI elements were generated could serve as

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[2]The term "attribute," as used in this paper, refers to a relatively stable behavioral predisposition, or potential, in relation to a specified class of tasks, conditions, or outcomes. Thus, an ability is defined in terms of level of proficiency on a specified class of tasks, while an affective attribute (such as an interest or a need) might be defined in terms of the strength of the tendency to approach or avoid a specified class of tasks, conditions, or outcomes (Cunningham, 1971).

bases for combining these variables and defining the work structure, it was felt that a more systematic and empirically based procedure should be used to derive a comprehensive set of work dimensions. Accordingly, OAI dimensions were derived through the application of a factor-analytic procedure to two sets of data: (1) the attribute-requirement profiles of the OAI items (work elments) and (2) the ratings of a large, representative sample of jobs on the OAI items. For each set of data, separate factor analyses were performed on the items within each of the major OAI categories. Next, the resulting first-order factors were themselves factor analyzed within each data set in order to (1) reduce the redundancy in these original factors, (2) reduce the factors to a more manageable number, and (3) produce factors which (hopefully) could be interpreted in accordance with the information-processing paradigm shown in Figure 2 (p. 9)--i.e., factors defined by kinds of Information Received, Mental Activities, Work Behavior, Work Goals, and Work Context.

Although the mathematical procedure is the same in both cases, the two forenamed data bases yield factors which are subject to different interpretations. The factors derived from the attribute-requirement data are comprised of OAI work elements which tend to have similar human attribute requirements, whereas factors based on the job-rating data are defined by work elements which tend to occur together in jobs. Thus, the factors based on attribute data do not necessarily represent combinations of work elements as they actually occur in the world of work, while factors based on job data do not necessarily contain work elements which are homogeneous in terms of their human attribute requirements. As noted by Jeanneret and McCormick (1969), work dimensions derived through these two different approaches should be evaluated in terms of their respective utilities. It is possible, for example, that dimensions reflecting the coexistence of work elements in jobs would prove more useful in describing occupations for curriculum development purposes, whereas dimensions whose constituent work elements are homogeneous in their attribute requirements might be best used in establishing attribute-requirement profiles for occupations and occupational clusters--profiles which, in turn, might be applied to problems in occupational guidance and placement.

Despite the different interpretations associated with factors derived from the two data bases, OAI factors from either data set represent classes of work activities and conditions, and can be used to describe jobs and occupations in these terms (that is, in terms of work-dimension profiles). Furthermore, since the elements comprising either set of work dimensions are weighted in terms of their human attribute requirements, work-dimension profiles can be transformed into attribure-requirement profiles for jobs. Thus, both work-dimension and attribute-requirement profiles can be derived for jobs analyzed with the OAI.

The derivation of OAI work dimensions is reported in the three following COE Research Monographs: (1) Human Attribute Requirements of Work Elements: Further Development of the Occupation Analysis

Inventory (Neeb, Cunningham, and Pass, 1971); (2) Work Dimensions Derived Through Systematic Job Analysis: A Study of the Occupation Analysis Inventory (Riccobono and Cunningham, 1971a); and (3) Work Dimensions Derived Through Systematic Job Analysis: A Replicated Study of the Occupation Analysis Inventory (Riccobono and Cunningham, 1971b).

Validation of the OAI

The OAI has been validated against four sets of criterion variables: (1) Altman's general vocational capability (GVC) tests; (2) the General Aptitude Test Battery (GATB) of the U. S. Employment Service; (3) the Ohio Vocational Interest Scales (OVIS) (D'Costa et al., 1970); and (4) the scales of the Minnesota Importance and Satisfaction Questionnaires (MIQ and MSQ), which were designed to measure 20 work-related psychological needs and corresponding satisfactions (Gay et al., 1971).

Validation Against the GVC and GATB Scores

As mentioned earlier, the OAI was designed to describe jobs and occupations with somewhat greater specificity than Altman's general vocational capability (GVC) tests describe people. In this regard, it was reasoned that if the OAI work dimensions are meaningful in terms of human capabilities, then clusters comprised of occupations with similar work-dimension profiles should be discriminable in terms of their GVC requirements, as these are reflected by the average GVC test scores of persons who are either successfully employed in or have successfully completed training for the occupations.[3] (This assumes, of course, that both the tests and the training programs--if graduate trainees are used--are valid.) Accordingly, we would predict significant differences among these clusters in terms of the GVC test scores of workers or graduate trainees associated with the occupations in the clusters. Moreover, we might expect to find significant correlations between the GVC-requirement estimates for occupations (obtained through OAI analysis) and the average GVC test scores of incumbents or graduate trainees in these occupations. Empirical support for the

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[3]The following assumptions underlie the use of average GVC scores as criteria: (1) persons who perform successfully in an occupation (or an occupational training program) were either initially above or later attained the minimum level of the GVC's required by that occupation; (2) hence, the average GVC test score profiles of successful incumbents or graduate trainees in an occupation will equal or exceed the minimum GVC requirements of that occupation; and (3) therefore, the average GVC score profiles of successful incumbents or graduate trainees should reflect the GVC requirements of that occupation.

above hypotheses could be interpreted as support for the construct validity of the OAI. Part of the OAI project was designed to test these hypotheses, using GVC test scores of students nearing graduation in post-secondary vocational and technical curricula for occupations which were analyzed with the OAI.

Similar rationale and procedures were also employed in validating the OAI against GATB data consisting of mean test scores of incumbents in approximately 280 occupations. (These data were collected by the U. S. Employment Service, 1967.) Significant relationships between these data and the OAI work-dimension and aptitude-requirement scores for occupations would support both the construct and synthetic validity[4] of the OAI and would provide encouragement for its potential use in estimating the aptitude requirements of occupations and occupational clusters. The work of McCormick and his associates (McCormick, Jeanneret, and Mecham, 1969a; Mecham and McCormick, 1969a, 1969b) demonstrates the feasibility of deriving aptitude-requirement estimates through systematic job analysis.

The validation of the OAI against GVC and GATB data will be reported in a COE Research Monograph titled Cognitive Correlates of Systematically Derived Work Dimensions: Validation of the Occupation Analysis Inventory (Bates and Cunningham, in press).

Validation of the OAI Against Interest and Need Data

It was hypothesized that clusters containing occupations that are similar based upon their OAI work-dimension profiles would be discriminable in terms of their interest and need correlates, as these are reflected by the average interest and need inventory scores of persons employed in the occupations.[5] This hypothesis has been

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[4]"Synthetic validity" refers to the application of systematic job analysis in estimating the attribute requirements of jobs and thereby identifying tests which should be valid in predicting job success (Lawshe, 1952; McCormick, 1959; McCormick, Cunningham, and Thornton, 1967; McCormick, Jeanneret, and Mecham, 1969a).

[5]The following assumptions underlie the use of average interest and need scores of incumbents as criteria: (1) within the constraints of the environment, people tend to gravitate to and remain in occupations that are compatible with their interests and needs (Weiss et al., 1966); (2) with increased tenure in an occupation a person's interests and needs tend to shift in the direction of that occupation's reinforcement pattern; and (3) consequently, the average interest and need profiles of a representative group of incumbents in an occupation should reflect the interest and need correlates of that occupation--that is, their interest and need profiles should parallel the reinforcement profiles of the occupation.

tested with the following data: (1) scores of incumbents in 43 occupations on the Ohio Vocational Interest Scales (OVIS); (2) item profiles for 47 occupations on the Strong Vocational Interest Blank; (3) average scores of incumbents in 47 occupations on 22 basic scales for the Strong Vocational Interest Blank (Campbell et al., 1968); and (4) scores of incumbents in 43 occupations on the Minnesota Importance Questionnaire (MIQ).[6]

In addition to the above hypothesis, the following predictions were tested: (1) the OAI interest-requirement and need-requirement estimates for a sample of occupations should correlate significantly with the average interest (OVIS) and need (MIQ) scores of incumbents in these occupations; and (2) the satisfaction scores of job incumbents (measured by the MSQ) should be significantly related to the degree of congruence between their MIQ need scores and the OAI need-requirement (or reinforcement) estimates for their occupations; that is, measured satisfaction should increase with an increase in the estimated compatibility between the worker's needs and the reinforcements offered by his occupation.

The validation of the OAI against interest and need inventory data will be reported in a COE Research Monograph titled Affective Correlates of Systematically Derived Work Dimensions: Validation of the Occupation Analysis Inventory (Tuttle and Cunningham, in press).

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[6]The data in (1) and (4) were collected by the present investigators; the data in (2) and (3) were available from previous research.

POTENTIAL APPLICATIONS

Some potential applications of ergometrics (or psychometrically-based work analysis) to problems in occupational education have been discussed in an earlier paper (Cunningham, 1971). The present discussion will thus be limited to the practical implications of the OAI research in the following areas: (1) curriculum development, (2) test development, (3) curriculum evaluation, (4) guidance and placement, and (5) educational planning.

Curriculum Development

A work structure derived from the OAI work dimensions could provide a basis for curriculum development at several levels. (The development of a work taxonomy is discussed on pp. 26-29.) At the elementary and middle-grade levels, occupational awareness and exploration curricula could be developed around clusters containing occupations with similar work-dimension profiles. The average work-dimension profiles for the clusters would provide a guide to curricular content down to the level of specificity of the individual OAI work elements (items). In addition, the OAI work dimensions themselves might serve as structural bases for the development of curricula designed to teach basic skills in the early grades.

At more advanced grade levels (e.g., late-middle and early-secondary), curricula directed toward general vocational capabilities (GVC's) might be developed corresponding to the OAI work dimensions. Such curricula could be related to specific occupational clusters, or could be treated as modules to be combined according to the needs of individual students (or identifiable groups of students) and the requirements of different occupations and occupational clusters. The GVC curricula could serve as links between basic academic curricula and focused vocational, technical, and professional curricula.

These latter (advanced) curricula could, in turn, be based upon OAI occupational clusters which, in accordance with the focus of the curricula, would be considerably narrower than clusters defined for the earlier levels. Although the average OAI work-dimension profiles of these narrower clusters would provide broad outlines for the development of vocational, technical, and professional curricula, it would be necessary to further analyze each cluster. One approach to the detailed analyses of the OAI clusters would involve the application of the task-inventory procedures developed by the U. S. Air Force (Archer, 1966; Christal, 1970; Morsh and Archer, 1967) and currently being adapted for civilian use at The Ohio State University Center for Vocational and Technical Education.[7] The OAI interest-requirement

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[7] S. D. Brocher and F. C. Pratzner, Center for Vocational and Technical Education, The Ohio State University, personal communication, September 9, 1971.

and need-requirement estimates for the occupational clusters could be used as a guide in determining what reinforcements would be emphasized and employed in the cluster curricula. In conjunction with advanced curricula based upon OAI clusters, it might also prove feasible in some instances to develop modular curricula corresponding to certain OAI work dimensions (e.g., Dimension E-1: Supervisory Activities). These modular curricula would apply to a number of occupational clusters at the vocational, technical, and professional levels.

Additional applications of the OAI might be found in the development of occupationally related curricula for teachers and curricula designed in accordance with the attributes, experiences, and needs of target populations.

Test Development

The OAI work dimensions and elements could prove useful in test development. For example, a battery of general occupational capability tests might be developed corresponding to the OAI dimensions; the work elements comprising a particular dimension would define the categories of items to be constructed for that dimension. An occupational awareness (or information) test might also be developed within a framework of occupational clusters derived through use of the OAI dimensions. In this case, each cluster would be described by an average profile of work-dimension scores which, along with the work elements defining the dimensions, would serve as a guide for generating test items. Moreover, through a relatively straightforward procedure, the work elements in selected OAI dimensions could be transformed into occupational interest items which, when summed, would provide interest scores for these dimensions. This approach has, in fact, been taken in translating the elements (items) in McCormick et al.'s Position Analysis Questionnaire into items comprising an Interest Analysis Questionnaire (Mecham, 1971). Finally, it would seem potentially feasible to develop occupational proficiency tests corresponding to OAI occupational clusters. The average work-dimension profiles for these clusters (along with the individual elements defining the dimensions) might provide the outlines for such tests, while the specific test items could be defined through the task-inventory approach and task analysis. The items comprising such a test could be derived from task statements which were applicable to a sizable proportion of occupations in the relevant cluster (cf. Altman, 1966).

Curriculum Evaluation

The OAI system and its related measures might also be applied in the area of curriculum evaluation. For example, the OAI (or a

modification of it) could be used to perform comparative analyses between cluster curricula and groups of occupations toward which the curricula are directed. Thus, if a curriculum simulates reasonably well the occupations for which it is intended, we would expect some appreciable agreement between separate OAI analyses of the curriculum and the occupations in the curricular cluster--i.e, there should be considerable commonality between the curriculum and the occupations. The OAI approach might be applied for this purpose to both occupational exploration and general vocational capabilities curricula; however, at the vocational, technical, and professional levels, it would be necessary to use the task-inventory approach in conjunction with the OAI, in order to attain the necessary degree of resolution (or specificity) in the comparative analyses.

In addition to curriculum evaluation based on content analysis (which might be considered a check on the content validity of curricula), measures derived from the OAI might be used to evaluate curricula in terms of student performance. The various tests discussed in the preceding section should be appropriate for curriculum-evaluation purposes. Furthermore, performance rating scales--either based on the OAI dimensions or developed through task-inventory analyses of OAI clusters--could be applied in curriculum evaluation as well as in individual assessment. Such scales could be used by instructors, employers, or outside evaluators.

Guidance and Placement

Another application of the OAI might be found in the development of occupational guidance and placement systems. As mentioned, both work-dimension and attribute-requirement profiles can be derived for occupations rated on the OAI; and these profiles could be used in describing, comparing, and grouping occupations and in describing the resultant occupational clusters. In the guidance setting, the test score profiles of individuals could be compared with the OAI attribute-requirement profiles of occupations and occupational clusters. Computerization would accommodate a large number of such comparisons, providing the individual with indices of congruence (or match) between his test profiles and the attribute-requirement profiles of selected occupations or occupational clusters. This profile-matching approach could also be used in educational and job placement. Moreover, the OAI work-dimension profiles of occupations and occupational clusters might be translated into information which could be used by the counselee in vocational exploration and decision-making. The specificity in this information would be at the level of the individual OAI work elements (items) defining the dimensions.

Educational Planning

Adequate planning in occupational education requires information concerning both the nature of the occupational structure and manpower requirements for various categories within this structure. An

appropriate representation of the occupational structure might be found in a taxonomy consisting of occupational clusters described by OAI work-dimension and attribute-requirement profiles. This taxonomy could be developed through application of a short form of the OAI to a very large, representative sample of occupations (see p. 28). Such a scheme would define the categories (or clusters) for which manpower requirements could be determined on the local, regional, and national levels. National and regional manpower estimates for these categories might be obtained from U. S. Census data. Information on the manpower requirements for various OAI clusters would constitute one factor to be considered in decisions concerning such matters as: the introduction and revision of curricula; teacher and student recruiting; design, expansion, and remodeling of facilities; and resource allocation.

The aforementioned information concerning manpower requirements would also be useful in identifying appropriate areas for the retraining of workers who are unemployed due to technological or economic changes. Other applications of the OAI system with planning implications might include: the projection of trends in manpower requirements in terms of OAI clusters, work dimensions, and attributes; and the estimation of human resources in relation to existing and projected manpower requirements at the local, regional, and national levels. (This might involve the use of the OAI short form and work questionnaire, discussed on pp. 28-29.)

FUTURE RESEARCH AND DEVELOPMENT

The work that has been accomplished in connection with the Occupation Analysis Inventory (OAI) is viewed as the beginning of a continuing R & D program. Some of the activities planned for this program are described below.

A Work Taxonomy

As mentioned before, there is a need for a taxonomy of human work that would provide information applicable to educational problems. Such a taxonomy should have the following characteristics (Cunningham, 1971): (1) its conceptual structure should be based on established principles and theories of human behavior; (2) it should deal with work at different levels of complexity, ranging from occupational categories (or clusters) to rather narrow classes of tasks and task characteristics; (3) it should identify developmental progressions (or vertical transfer sequences) in the acquisition of task capabilities, beginning with classes of relatively simple tasks learned in childhood (e.g., educational skills) and extending through classes of occupational tasks; (4) its elements, or descriptors, should be general enough for application to a variety of occupations, and yet specific enough to have curricular and other educational implications; (5) its elements should be linked to human dimensions for which there are standardized measures (i.e., tests in the cognitive, affective, and psychomotor domains); and (6) it should provide information that can be readily transformed into products for educational use (e.g., curricula, guidance systems, evaluation procedures, and tests). The research involving the OAI has been directed toward the taxonomy problem--a problem that will require the work of many investigators over a number of years.

An effort is currently under way at the Center for Occupational Education to establish a tentative framework for a work taxonomy. A representative sample of 814 written occupational descriptions (USES job schedules) has been rated on the OAI, and both work-dimension and attribute-requirement profiles have been derived for these occupations. The work-dimension profiles will be used to compute similarity indices among occupations, which in turn will provide a basis for occupational clustering. Clusters will be formed at different levels of specificity (from broad, general clusters to clusters that are somewhat narrow in scope) and will be tested for stability through replication with overlapping samples of occupations. Each cluster will be described in terms of an average work-dimension and an average attribute-requirement profile. It is felt that the resulting clusters and their descriptions might serve as a preliminary descriptive and classificatory scheme for jobs and occupations, a scheme which will be enlarged and revised as additional data are gathered.

Upon completion of the initial occupational clustering effort, an additional sample of approximately 600 occupations will be rated on the OAI. (More items, or work elements, will be added to the OAI prior to these ratings.) This sample will be selected on the basis of representativeness and projected employment opportunities. A cumulative sample of approximately 1400 occupations (the original 814 plus the additional 600 occupations) will then be used as a data base in deriving a revised set of work dimensions and occupational clusters. Besides the occupational ratings, additional attribute-requirement ratings will be obtained on the OAI work elements in order to increase the stability of the attribute-requirement profiles for the elements and, hence, for occupations rated on the OAI (cf. Neeb, Cunningham, and Pass, 1971). Each occupational cluster in the revised scheme will be described by both an average work-dimension and an average attribute-requirement profile.

The next step in the development of an OAI taxonomy will involve the identification of the important work dimensions for each occupational cluster and the enumeration and description of tasks and conditions relevant to these dimensions within the cluster. Wherever possible, existing task descriptions for occupations will be obtained from outside sources, although in many instances it will be necessary to develop task descriptions. An attempt will be made to identify tasks and conditions that are common to a number of occupations within each cluster. These common denominators might be identified through the task-inventory procedure (cf. Morsh and Archer, 1967; Christal, 1970) or through a non-quantitative approach such as that employed by Maley (1966).

Regardless of the procedure used in identifying common tasks and conditions, the resulting scheme will consist of occupational clusters characterized by work-dimension and attribute-requirement profiles and by descriptions of tasks and conditions that occur within each cluster. The scheme will thus range in specificity from narrow categories of tasks and conditions to rather broad occupational categories (clusters). Furthermore, the attribute-requirement profiles for work dimensions, occupations, and occupational clusters will provide at least a crude basis for establishing developmental progressions of the following order: (1) basic cognitive abilities, motor abilities, and educational skills; (2) general vocational capabilities; (3) broad categories of occupational proficiencies (represented by the OAI work dimensions); and (4) classes of advanced, or focused, task proficiencies (represented by task descriptions). (See Figure 1, p. 7.) Thus, it is anticipated that the previously listed criteria for a work taxonomy will be partially met by a descriptive and classificatory scheme derived from the OAI.

The development of a work taxonomy based on the OAI will require certain validation and instrument development activities. These are discussed in the following paragraphs.

Further Validation of the OAI

The problem of validating an instrument such as the OAI is similar to that of validating a test: it is a continuing proposition. Thus, regardless of the results of the current OAI studies, there will remain a need for further validation research. Such research might involve gathering additional data on the tests and occupations included in the current OAI studies (e.g., an increased sample of GVC data within occupations currently under study), as well as data on new occupations and tests. In addition, relationships between the OAI and other job description procedures (e.g., McCormick et al.'s Position Analysis Questionnaire) might be examined. An example of this latter validation approach can be found in a study reported by Holland et al. (1970), which demonstrated statistically significant relationships between Holland's occupational categories and McCormick et al.'s PAQ factors.

Further Development of Instruments for Work Description and Analysis

The development of a work taxonomy, as well as other ergometric R & D activities, would be facilitated by the availability of additional instruments for work description and analysis. These are discussed below.

Short form of the OAI. Rating a job on the 622-item OAI is a rather formidable task; experienced job analysts require an average of three hours to rate one written job description (USES job schedule) on this instrument. Although a large number of items was initially required to ensure adequate coverage at the level of descriptive specificity sought in the OAI, it should now be possible to construct a much shorter form of the OAI without an appreciable loss in information. If the items in the short form were based on the work dimensions (factors) obtained from the original OAI, the length of the instrument could be reduced three- to fivefold. Despite this reduction in length, however, it should be possible to rate a job on the short form and yet describe it at the level of specificity of the original OAI work elements, since the work dimensions on which the short-form items will be based are defined by the original OAI items. The validation of the short form will involve: (1) correlating the short-form ratings of a sample of jobs with the OAI factor scores obtained from ratings of the same jobs on the original (622-item) OAI; (2) clustering a sample of jobs based on both short-form and long-form ratings and comparing clusters obtained by the two forms; and (3) various analyses relating short-form ratings to the test data gathered originally for purposes of long-form validation. A short form of the OAI would increase the feasibility of large-scale taxonomy development, as well as other R & D activities requiring quantitative descriptions of large numbers of jobs or occupations.

Work questionnaire. If the short form of the OAI proves reasonably successful, a work questionnaire will be developed with which workers can describe their own jobs. The items in the work questionnaire will be derived from items in the OAI short and long forms, but will be written at a level appropriate for most workers (i.e., workers who are above some minimum level of literacy). (In some cases, the worker's supervisor might complete the questionnaire.) The procedures for validating the work questionnaire will be similar to those indicated for the short form. A reasonably reliable and valid work questionnaire would greatly facilitate the collection of data concerning both jobs and workers. In addition to its use in taxonomy development, such an instrument could be used in large-scale manpower studies and in employment counseling (i.e., as a device for comparing a worker's experience with various job requirements).

Task inventories. As previously mentioned, tasks will be identified and described for important work dimensions within each occupational cluster, and an effort will be made to identify tasks (or classes of tasks) that are common to a number of occupations within the cluster. The task-inventory procedure developed by the U. S. Air Force is one of the methods that will be used in identifying tasks that are characteristic of a cluster. The procedures for developing task inventories are described by Morsh and Archer (1967).

Test Development

The potential application of the OAI to test development was discussed earlier. Plans for future R&D include the development of three types of tests based on the OAI taxonomy: (1) an occupational interest inventory with scales corresponding to the revised set of OAI work dimensions (in this case, the higher-order factors); (2) a set of general occupational capability tests corresponding to the higher-order dimensions; and (3) an occupational awareness (or information) test based on the OAI clusters. In each case, specific task descriptions, as well as the OAI work elements, will be used in developing test items.

The resulting tests will be used in the ergometrically based program described in the following section.

An Ergometrically Based R & D Program

Figure 3 depicts an integrated and continuing R & D program organized in accordance with the proposed applications of ergometrics to occupationally related education (see pp. 22-25 of this paper and Cunningham, 1971). The major stages in this program include: (1) the gathering of information concerning the work domain and the educational system; (2) the transformation and organization of this information into a taxonomy of work; (3) the transformation of the taxonomic information

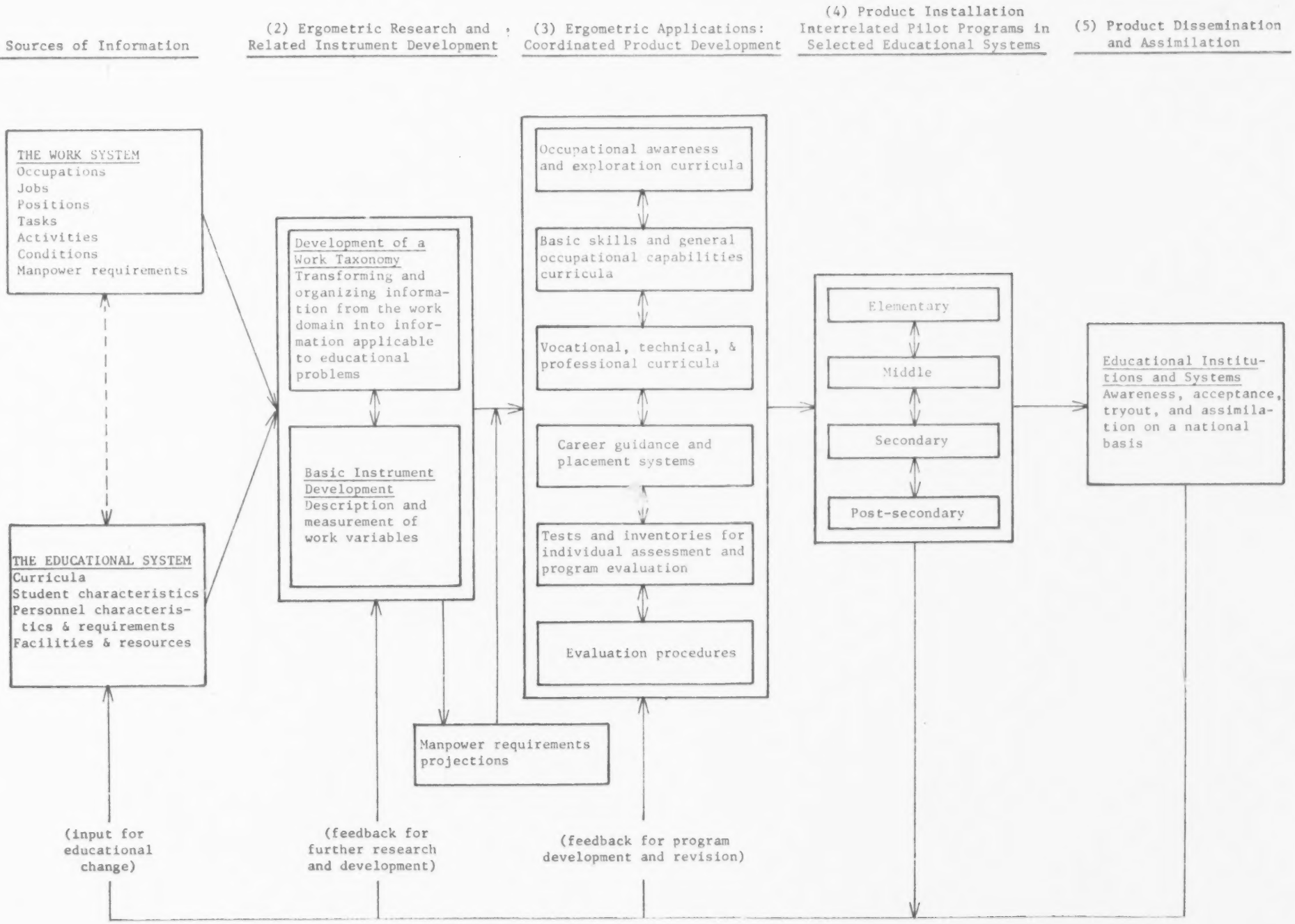
(1) Sources of Information
(2) Ergometric Research and Related Instrument Development
(3) Ergometric Applications: Coordinated Product Development
(4) Product Installation Interrelated Pilot Programs in Selected Educational Systems
(5) Product Dissemination and Assimilation
THE WORK SYSTEM
Occupations
Jobs
Positions
Tasks
Activities
Conditions
Manpower requirements
THE EDUCATIONAL SYSTEM
Curricula
Student characteristics
Personnel characteristics & requirements
Facilities & resources
Development of a Work Taxonomy
Transforming and organizing information from the work domain into information applicable to educational problems
Basic Instrument Development
Description and measurement of work variables
Occupational awareness and exploration curricula
Basic skills and general occupational capabilities curricula
Vocational, technical, & professional curricula
Career guidance and placement systems
Tests and inventories for individual assessment and program evaluation
Evaluation procedures
Manpower requirements projections
Elementary
Middle
Secondary
Post-secondary
Educational Institutions and Systems
Awareness, acceptance, tryout, and assimilation on a national basis
(input for educational change)
(feedback for further research and development)
(feedback for program development and revision)

Figure 3. Major Components in a Continuing Ergometrically Based R & D Program.

into an interrelated set of products for educational use; (4) the installation of these products in coordinated pilot programs; and (5) product dissemination and assimilation. As shown in the diagram, the ergometrically based program is envisioned as a continuing system, directed toward educational change and containing provisions for feedback, revision, and continued development.

The program outlined in Figure 3 would require a considerable investment in time and resources and the collaboration of several R & D organizations. For this reason, the Center for Occupational Education has planned an ergometrically based program considerably more modest in scope. This program, depicted in Figure 4, will employ the OAI taxonomy in the development of an exemplary educational program and accompanying tests and evaluation procedures. Specifically, the total R & D program will involve the development of (1) the previously described OAI taxonomy and accompanying instruments, (2) an occupational exploration and guidance program, and (3) an occupational interest inventory and an occupational awareness test to be used for individual assessment and program evaluation. The program plan calls for a three and one-half year period of development and two academic years for a pilot program.

It is hoped that this program will demonstrate the applicability of ergometrics to problems in education and that it will gradually expand in accordance with the scheme presented in Figure 3.

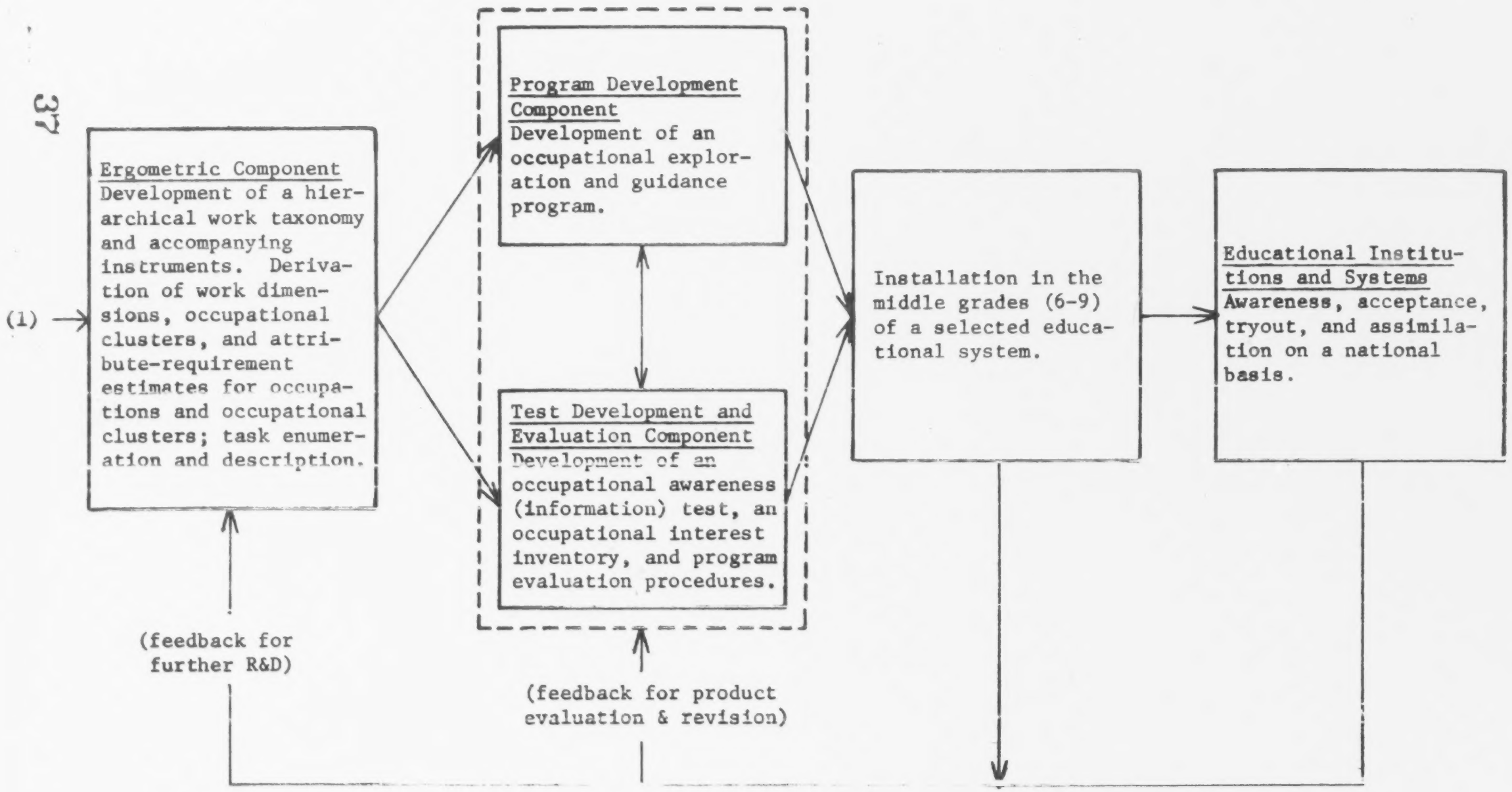
(2) Ergometric Research and Related Instrument Development
(3) Ergometrically Based Product Development
(4) Product Installation: Pilot Program
(5) Product Dissemination and Assimilation
(1)
Ergometric Component
Development of a hierarchical work taxonomy and accompanying instruments. Derivation of work dimensions, occupational clusters, and attribute-requirement estimates for occupations and occupational clusters; task enumeration and description.
Program Development Component
Development of an occupational exploration and guidance program.
Test Development and Evaluation Component
Development of an occupational awareness (information) test, an occupational interest inventory, and program evaluation procedures.
Installation in the middle grades (6-9) of a selected educational system.
Educational Institutions and Systems
Awareness, acceptance, tryout, and assimilation on a national basis.
(feedback for further R&D)
(feedback for product evaluation & revision)

Figure 4. Components in a Proposed Ergometrically Based R & D Program.

LIST OF REFERENCES

Alderfer, C. P. "An Empirical Test of a New Theory of Human Needs." Organizational Behavior and Human Performance, 1969, 4, 142-175.

Allen, J. C. "Multidimensional Analysis of Worker-Oriented and Job-Oriented Verbs." Journal of Applied Psychology, 1969, 53, 73-79.

Altman, J. W. Research on General Vocational Capabilities (Skills and Knowledges). Final Report, under a grant from the Ford Foundation. Pittsburgh: American Institutes for Research, 1966.

Anastasi, A. Psychological Testing, Third Edition. New York: MacMillan, 1968.

Archer, W. B. Computation of Group Job Descriptions from Occupational Survey Data. Lackland Air Force Base, Texas: Personnel Research Laboratory, Aerospace Medical Division, 1966.

Bates, Joe A. and J. W. Cunningham. Cognitive Correlates of Systematically Derived Work Dimensions: Validation of the Occupation Analysis Inventory. Center Research Monograph No. 11. Raleigh, North Carolina: Center for Occupational Education, in press.

Brocher, S. D. and F. C. Pratzner. Personal communication. September 9, 1971.

Campbell, D. P., F. H. Borgen, S. H. Eastes, C. B. Johansson, and R. A. Peterson. "A Set of Basic Scales for the Strong Vocational Interest Blank for Men." Journal of Applied Psychology, 1968, 52:6.

Christal, R. E. "Implications of Air Force Occupational Research for Curriculum Design." In B. B. Smith and J. Moss, Jr. (Eds.), Report of a Seminar: Process and Techniques of Vocational Curriculum Development. Minneapolis: Minnesota Research Coordinating Unit for Vocational Education, University of Minnesota, 1970.

Cragun, J. R. and E. J. McCormick. Job Inventory Information: Task and Scale Reliabilities and Scale Interrelationships. West Lafayette, Indiana: Occupational Research Center, Purdue University and Personnel Research Laboratory, Air Force Systems Command at Lackland Air Force Base, Texas, 1967.

Cronbach, L. J. Essentials of Psychological Testing, Third Edition. New York: Harper and Row, 1970.

Cunningham, J. W. "A Conceptual Framework for the Study of Job Similarities." In J. W. Cunningham (Ed.), The Job-Cluster Concept and Its Curricular Implications. Center Monograph No. 4. Raleigh, North Carolina: Center for Occupational Education, 1969. (ED 042 897)

Cunningham, J. W. "Ergometrics": A Systematic Approach to Some Educational Problems. Center Research Monograph No. 7. Raleigh, North Carolina: Center for Occupational Education, 1971.

D'Costa, Ayres G., David W. Winefordner, John G. Odgers, and Paul B. Koons, Jr. Ohio Vocational Interest Survey: Manual for Interpreting. New York: Harcourt Brace Jovanovich, Inc., 1970.

Fine, S. A. "Matching Job Requirements and Worker Qualifications." Personnel, 1958, 34, 52-58.

Fine, S. A. "The 1965 Edition of the Dictionary of Occupational Titles: Content, Contrasts, and Critique." The Vocational Guidance Quarterly, 1969, 17, 162-177.

Fleishman, E. A. The Structure and Measurement of Physical Fitness. Englewood Cliffs, New Jersey: Prentice-Hall, 1964.

Fleishman, E. A. "Human Abilities." Annual Review of Psychology, 1969, 349-380.

French, J. W., R. B. Ekstrom, and L. A. Price. Manual for Kit of Reference Tests for Cognitive Factors. Princeton, New Jersey: Educational Testing Service, 1963.

Gagné, R. M. "The Acquisition of Knowledge." Psychological Review, 1962, 69, 355-365.

Gagné, R. M. "Human Functions in Systems." In R. M. Gagné (Ed.), Psychological Principles in System Development. New York: Holt, Rinehart, and Winston, 1962.

Gay, E. G., D. J. Weiss, D. D. Hendel, R. V. Dawis, and L. H. Lofquist. Manual for the Minnesota Importance Questionnaire. Minnesota Studies in Vocational Rehabilitation, XXVIII. Minneapolis: University of Minnesota, 1971.

Guilford, J. P. "Intelligence: 1965 Model." American Psychologist, 1966, 21, 20-26.

Guilford, J. P. The Nature of Human Intelligence. New York: McGraw-Hill, 1967.

Guilford, J. P. and R. Hoepfner. The Analysis of Intelligence. New York: McGraw-Hill, 1971.

Hemphill, J. K. "Job Descriptions for Executives." Harvard Business Review, 1959, 37, 55-67.

Holland, J. L., M. C. Viernstein, H. M. Kuo, N. L. Karweit, and Z. D. Blum. A Psychological Classification of Occupations. Report No. 90. Baltimore: Johns Hopkins University, 1970.

Jeanneret, P. R. and E. J. McCormick. The Job Dimensions of "Worker-Oriented" Job Variables and Their Attribute Profiles as Based on Data from the Position Analysis Questionnaire. Report No. 2. West Lafayette, Indiana: Occupational Research Center, Purdue University, 1969.

Lawshe, C. H., Jr. "Employee Selection." Personnel Psychology, 1952, 31-34.

McCormick, E. J. "The Development of Processes for Indirect or Synthetic Validity: III. Application of Job Analysis to Indirect Validity. A Symposium." Personnel Psychology, 1959, 12, 402-413.

McCormick, E. J. The Development, Analysis, and Experimental Application of Worker-Oriented Job Variables. Final Report. West Lafayette, Indiana: Occupational Research Center, Purdue University, 1964.

McCormick, E. J., J. W. Cunningham, and G. C. Thornton. "The Prediction of Job Requirements by a Structured Job Analysis Procedure." Personnel Psychology, 1967, 20, 431-440.

McCormick, E. J., P. R. Jeanneret, and R. C. Mecham. The Development and Background of the Position Analysis Questionnaire. Report No. 5. West Lafayette, Indiana: Occupational Research Center, Purdue University, 1969.

McCormick, E. J., P. R. Jeanneret, and R. C. Mecham. A Study of Job Characteristics and Job Dimensions as Based on the Position Analysis Questionnaire. Report No. 6. West Lafayette, Indiana: Occupational Research Center, Purdue University, 1969.

Maley, D. An Investigation and Development of the Cluster Concept as a Program in Vocational Education at the Secondary School Level. Final Report. College Park: University of Maryland, 1966. (ED 010 301)

Marland, S. P., Jr. Career Education. Paper presented before the Thirty-Third Session of the International Conference on Education, Geneva, Switzerland, September, 1971.

Mecham, R. C. Personal communication. July 2, 1971.

Mecham, R. C. and E. J. McCormick. The Use of Data Based on the Position Analysis Questionnaire in Developing Synthetically-Derived Attribute Requirements of Jobs. Report No. 4. West Lafayette, Indiana: Occupational Research Center, Purdue University, 1969.

Mecham, R. C. and E. J. McCormick. The Rated Attribute Requirements of Job Elements in the Position Analysis Questionnaire. Report No. 1. West Lafayette, Indiana: Occupational Research Center, Purdue University, 1969.

Miller, R. B. "Task Description and Analysis." In R. M. Gagné (Ed.), Psychological Principles in System Development. New York: Holt, Rinehart, and Winston, 1962.

Morsh, J. E. and W. B. Archer. Procedural Guide for Conducting Occupational Surveys in the United States Air Force. Lackland Air Force Base, Texas: Personnel Research Laboratory, Aerospace Medical Division, 1967. (AD 664 036)

National School Public Relations Association. "USOE Launches Its Top Priority--Career Education." Washington Monitor, September 20, 1971, p. 17.

Neeb, Robert W., J. W. Cunningham, and John J. Pass. Human Attribute Requirements of Work Elements: Further Development of the Occupation Analysis Inventory. Center Research Monograph No. 7. Raleigh, North Carolina: Center for Occupational Education, 1971.

Riccobono, John A. and J. W. Cunningham. Work Dimensions Derived through Systematic Job Analysis: A Study of the Occupation Analysis Inventory. Center Research Monograph No. 8. Raleigh, North Carolina: Center for Occupational Education, 1971.

Riccobono, John A. and J. W. Cunningham. Work Dimensions Derived through Systematic Job Analysis: A Replicated Study of the Occupation Analysis Inventory. Center Research Monograph No. 9. Raleigh, North Carolina: Center for Occupational Education, 1971.

Stolurow, L. M. A Taxonomy of Learning Task Characteristics. TDR Report No. AMRL-TDR-64-2. Urbana: University of Illinois, 1964.

Stolurow, L. M. Psychological and Educational Factors in Transfer of Training. Quarterly Reports No. 8 and 9. Urbana: University of Illinois, 1964.

Thurstone, L. L. "Primary Mental Abilities." Psychometric Monographs, No. 1, 1938.

Tuttle, Thomas C. and J. W. Cunningham. Affective Correlates of Systematically Derived Work Dimensions: Validation of the Occupation Analysis Inventory. Center Research Monograph No. 10. Raleigh, North Carolina: Center for Occupational Education, in press.

U. S. Department of Labor. Dictionary of Occupational Titles: Definitions of Titles, Volume 1, Third Edition. Washington, D. C.: U. S. Government Printing Office, 1965.

U. S. Employment Service, U. S. Department of Labor. Manual for the General Aptitude Test Battery, Section III: Development. Washington, D. C.: U. S. Government Printing Office, 1967.

Vernon, P. E. The Structure of Human Abilities, Revised Edition. London: Methuen, 1960.

Weiss, D. J., R. V. Dawis, L. H. Lofquist, and G. W. England. Instrumentation for the Theory of Work Adjustment. Minnesota Studies in Vocational Rehabilitation, XXI. Minneapolis: Industrial Relations Center, University of Minnesota, 1966.

APPENDIX

The Occupation Analysis Inventory

OCCUPATION ANALYSIS INVENTORY

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Raleigh, North Carolina

INSTRUCTIONS

Purpose and Organization of the Inventory

The Occupation Analysis Inventory (OAI) is a research instrument designed for use in analyzing jobs and occupations in terms of basic work elements. The work elements appear in this instrument under five main category headings:

A. INFORMATION RECEIVED

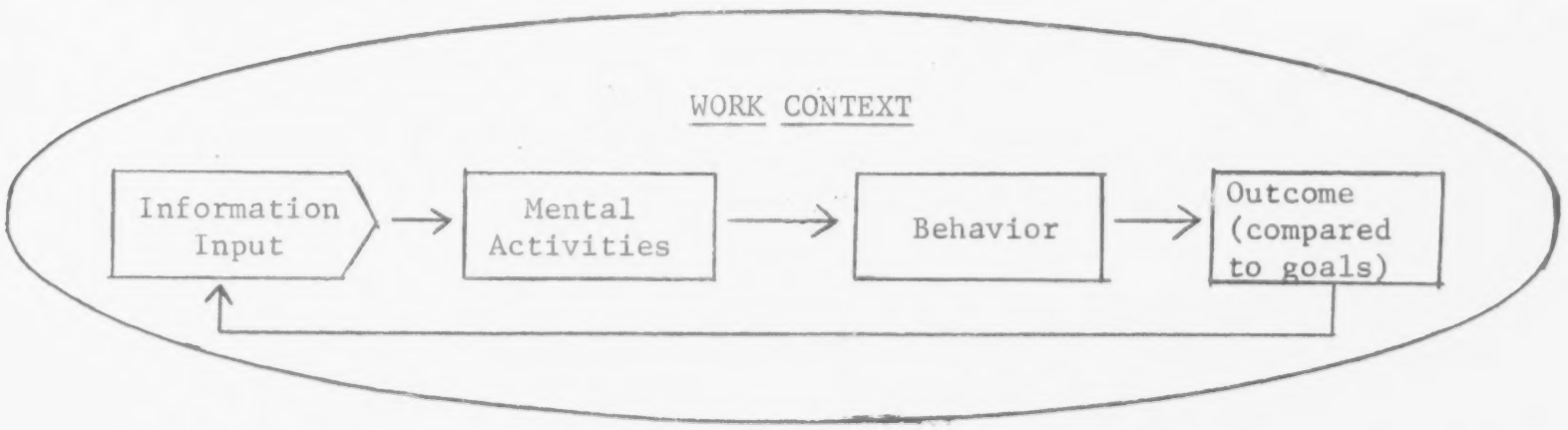
B. MENTAL ACTIVITIES

C. WORK BEHAVIOR

D. WORK GOALS

E. WORK CONTEXT

These category headings correspond to the five components in the information processing model shown below.



The category headings appear on yellow divider sheets. These main divisions are further divided according to the following format:

CATEGORY HEADINGS (appear on yellow divider sheets)

SUBCATEGORY HEADINGS (appear on white title sheets, typed in all capital letters)

Section Headings (appear on white title sheets, typed in capital and lower case letters)

Group Headings (appear in boxes at the tops of pages)

Margin Headings (appear at the left-hand margins of pages, underlined)

Items--work elements (identified by numbers with subscript letters; jobs are rated on items)

The OAI items (work elements) describe various aspects of work activities and conditions. Most of the work elements are illustrated with specific examples. However, these examples are intended only as aids to understanding the idea behind each work element; they should not be treated as if they accounted for all possible instances of the work element.

How to Analyze a Job with the Inventory

First, read through the Occupation Analysis Inventory (OAI) and become familiar with its contents. You will notice that each item (work element) is numbered and has a code (a capital letter in parentheses) in front of it. The code designates the scale which should be used in rating a job on the OAI item. The titles of the rating scales and their corresponding codes are as follows:

Code	Scale Title
(S)	Significance
(E)	Extent
(A)	Applicability
(*)	Special Scale (scale appears below the work element definition)

The (S), (E), and (A) scales are shown on the next three pages. An asterisk indicates that the item has a special scale, which will appear in that item and should be used to rate the job on the work element in question.

After thoroughly reviewing the OAI, you should become familiar with the job you are going to analyze. This can be accomplished through exposure to written materials pertaining to the job, interviews with workers and supervisors, observation of work in progress, etc. Do not begin rating the job on the OAI work elements until you are familiar with both the OAI and the job to be analyzed.

Further instructions are presented for various sets of items (work elements) throughout the inventory. Please read such instructions carefully before rating a job on the items in question. Be sure to rate the job on every OAI item--please do not omit any ratings--and use only the scale indicated for each item.

Significance Scale (S)

Consider whether or not the work element in question occurs in the job being rated. If it does not occur, assign the job a rating of "0" on the element. If the element does occur in the job, decide how significant a part of the job that element is. In making your decision, consider and weigh such factors as importance of the element to the job, how frequently that element occurs in the job, the amount of job time required by that element, or any other factor which you think should determine to what extent the element is part of the job. Use the scale shown below in assigning your rating.

Scale Value	Significance
0	Inapplicable: Does not occur in the job
1	May occasionally be a minor part of the job
2	A small part of the job
3	A moderately significant part of the job
4	A substantial part of the job
5	A very significant part of the job

Extent Scale (E)

Indicate the extent to which the OAI work element applies to or occurs in the job being rated. In making your rating, consider such factors as the frequency or likelihood of occurrence of the work element, the amount of time that it occurs, and the level at or degree to which it occurs in the job.

Scale Value	Extent
0	Does not apply
1	To a very small extent
2	To a limited extent
3	To a moderate extent
4	To a considerable extent
5	To a great extent

Applicability Scale (A)

Indicate whether or not the OAI work element applies to or occurs in the job being rated.

Scale Value	Applicability
0	Not applicable to this job
1	Applies to this job

A. INFORMATION RECEIVED

THIS CATEGORY OF ITEMS DEALS WITH THE INPUT OF INFORMATION TO THE WORKER. IT IS DIVIDED INTO TWO SUBCATEGORIES: INFORMATION CONTENT AND SENSORY CHANNEL.

INFORMATION CONTENT

THIS SUBCATEGORY OF ITEMS DEALS WITH VARIOUS TYPES OF INFORMATION WHICH ARE USED BY THE INCUMBENT IN PERFORMING HIS JOB. THIS INFORMATION MAY BE USED TO INITIATE OR GUIDE THE INCUMBENT'S IMMEDIATE BEHAVIOR OR IT MAY BE STORED AND USED TO GUIDE HIS SUBSEQUENT BEHAVIOR. JOB INFORMATION IS OF TWO TYPES:

DIRECT INFORMATION IS RECEIVED THROUGH ANY SENSORY CHANNEL AND COMES FROM DIRECT, ON-THE-SCENE CONTACT WITH THE OBJECTS, MATERIALS, DEVICES, SITUATIONS, EVENTS, OR PERSONS IN QUESTION. EXAMPLES OF DIRECT INFORMATION ARE: OBSERVATION OF A MACHINE IN OPERATION, SOUND OF POORLY ADJUSTED VALVES IN AN AUTOMOBILE ENGINE, TACTUAL FEEDBACK FROM AN AUTOMOBILE STEERING WHEEL, SMELL OF ELECTRICAL INSULATION BURNING, TASTE OF FOOD, WATCHING AN ACTOR PERFORM, OBSERVATION OF CLOUD FORMATIONS, SOUND OF PATIENT'S HEARTBEAT, FACIAL EXPRESSION INDICATING A STRONG EMOTION, ETC.

INDIRECT INFORMATION IS AT LEAST ONE STEP REMOVED FROM THE OBJECTS OR EVENTS IN QUESTION. IT IS OBTAINED PRIMARILY FROM VERBAL OR SYMBOLIC SOURCES WHICH REFER TO OBJECTS, MATERIALS, DEVICES, SITUATIONS, EVENTS, OR PERSONS. EXAMPLES OF INDIRECT INFORMATION INCLUDE: WRITTEN MATERIAL, ORAL REPORTS OR DESCRIPTIONS, DIAGRAMS, CHARTS, SYMBOLS, GRAPHS, TABLES OF NUMBERS, MEASURING DEVICES, TESTING EQUIPMENT, SPEECH, PICTURES, ETC.

THE INFORMATION CONTENT ITEMS FALL INTO THE FOLLOWING 10 CATEGORIES:

MECHANICAL	ART/DECORATIONS
ELECTRICAL	BIOLOGICAL/HEALTH
SPATIAL/STRUCTURAL	SEMANTIC/SYMBOLIC
MATERIALS	BUSINESS/SALES
ENVIRONMENT	PEOPLE/ANIMALS

AS YOU RATE THESE ITEMS, PLEASE KEEP IN MIND THE DISTINCTION BETWEEN DIRECT AND INDIRECT INFORMATION.

MECHANICAL INFORMATION

Information pertaining to mechanical devices. A mechanical device consists of an assemblage of parts which operate according to principles of gears, linkages, connections and fittings, leverage, screws, hydraulics, aerodynamics, balance, friction, and vibration. Mechanical devices may be man-powered, fuel-powered, electrically powered, steam or hydraulically powered, or powered by natural forces such as water or wind. Examples of mechanical devices include: vehicles; card sorters; cranes; vending machines; drill presses; heating-air conditioning systems; chain saws; sewing machines; cameras. Examples of jobs in which mechanical information is relevant include: auto mechanic; stationary engineer; truck driver; machinist; air conditioning mechanic; operating engineer; sewing machine operator; mechanical engineer; aeronautical engineer; mechanics physicist; etc.

Direct Sensory Information: Indicate the significance (to the job) of direct sensory information pertaining to the following aspects of mechanical devices:

1i. (S)_____ Overall state of mechanical functioning (whether automobile engine knocks, whether a bulldozer displays sufficient power, whether a card sorter operates properly, whether a drill press "squeals," whether a furnace has an unusual odor, etc.)

2i. (S)_____ Quantity and quality of machine output in relation to standards of performance or quality control (whether parts being fabricated by an automatic machine are in tolerance, whether a compressor maintains sufficient pressure, whether a key punch punches holes in the center of the card column, whether a vehicle will stop within a prescribed distance, etc.)

3i. (S)_____ State of preventive maintenance (whether parts need grease or oil, sprockets are dry, surfaces scratched or pitted, fasteners loose, hoses cracked, etc.)

4i. (S)_____ Malfunction of specific parts or components (whether radiator cap loses pressure, carburetor mixture control is too lean, teeth on a chain saw sprocket broken, camera shutter release broken, ribbon reverse mechanism of a typewriter inoperative, a machine gear out of line, etc.)

5i. (S)_____ Control or regulation of mechanical devices (tactual feedback from steering mechanism, feedback from clutch, dial settings on control panel, position of hand crank mechanism, position of switches, dial and gauge readings with control implications, etc.)

6i. (S)_____ Interrelations of mechanical parts (gears, pulleys, linkages, balance, alignment, optical components, bearings, etc.)

7i. (S)_____ Mechanical motion (material moving through machines, vehicles in motion, motion of machine parts, machines or other objects in collision or physical interaction, etc.)

Indirect Mechanical Information: Indicate the significance (to the job) of indirect information related to mechanical devices or systems from the following sources:

8i. (S)_____ Mechanical drawings (tool drawings, machine drawings, working drawings, machine layout drawings, plumbing and heating diagrams, etc.)

9i. (S)_____ Displays (gauges, dials, audio warning devices, etc.)

10i. (S)_____ Mechanical test equipment and measuring devices (micrometers, feeler gauges, timing light, hydrometer, etc.)

11i. (S)_____ Written material pertaining to mechanical devices (repair manuals, technical manuals, instructions on machine operation, parts catalog, etc.)

12i. (S)_____ Written material pertaining to mechanical or physical principles (principles of velocity, acceleration, motion, friction, etc.)

ELECTRICAL AND ELECTRONIC INFORMATION

Information pertaining to electrical devices or electrical systems. An electrical device or system is an assemblage of interconnected or interrelated parts or components operating by principles of electricity or electronics to accomplish some purpose. Examples of electrical devices or systems include: domestic wiring systems, electrical system of an electric appliance, a television set, a computer, an automobile electrical system, a stereo or hi-fi system. Components of electrical systems or devices include: switches, wires, amplifiers, speakers, generators, transistors, resistors, tubes, etc. Examples of jobs in which electrical information is relevant include: electrician, appliance serviceman, radio operator, radar serviceman, appliance quality control inspector, auto generator repairman, instrument technician, electrical lineman, electrical engineer, electronics physicist, etc.

Direct Sensory Information: Indicate the significance (to the job) of direct sensory information pertaining to the following aspects of electrical or electronic systems or devices:

13i. (S)_____ Overall performance of electrical/electronic devices in relation to standards (whether a television picture has the required brightness and focus, whether an electric heater sufficiently heats, whether a lighting system properly illuminates a room, whether a radio receiver is static-free, whether a stereo system provides sound separation, etc.)

14i. (S)_____ State of preventive maintenance (cracked insulation, loose connections, rusty chassis, worn generator brushes, corroded battery terminals, cracked power tube, missing insulation, etc.)

15i. (S)_____ Interrelations or interconnections of electrical or electronic parts (input-output connections, connection of batteries to components, wiring patterns, physical location and connection of components, etc.)

16i. (S)_____ Malfunctions of specific electrical/electronic parts or components (burned fuses, burned capacitors, damaged transistors, shorted resistors, scarred generator armature, etc.)

17i. (S)_____ Regulation and control of electrical and electronic systems (setting of knobs or dials; position of selector switches, position of push buttons, dial readings with control implications, etc.)

Indirect Electrical/Electronic Information: Indicate the significance (to the job) of indirect information concerning electrical or electronic devices from the following sources:

18i. (S)_____ Electrical/electronic schematics and diagrams (circuit diagrams, wiring diagrams, component layout diagrams, schematic diagrams, electrical working drawings, etc.)

19i. (S)_____ Electrical/electronic symbols and codes (electronic symbols, color codes, wiring symbols, radio symbols, etc.)

20i. (S)_____ Displays conveying electrical/electronic information (gauges, dials, lights, audio warning signals, etc.)

21i. (S)_____ Electrical/electronic test equipment and measuring devices (oscilloscopes, ammeters, ohmmeters, potentiometers, circuit testers, voltmeters, etc.)

22i. (S)_____ Written material pertaining to electrical or electronic devices (repair manuals, technical articles, instructions for installation, operator manuals, reports of equipment testing, etc.)

23i. (S)_____ Written material pertaining to basic principles of electricity/electronics (principles of current flow, resistance, inductance, capacitance, voltage transformation, nuclear generation of electricity, etc.)

SPATIAL/STRUCTURAL INFORMATION

Information pertaining to the interrelationships of objects or parts. This includes the arrangement of connected parts which form an object or structure (as in construction and assembly) as well as the layout or arrangement of unconnected objects within a prescribed space or area (the arrangement of objects to meet some criterion, such as efficient space utilization, efficient utilization of material, or aesthetic balance). Examples of jobs in which such information is relevant include: carpenter, designer, draftsman, sheet metal worker, skilled steel construction worker, landscaper, model builder, architect, fashion designer, tailor, civil engineer, etc.

Direct Sensory Information: Indicate the significance (to the job) of direct sensory information pertaining to the following aspects of interrelated parts and objects:

241. (S)_____ Interrelation, position, and fit of connected parts or objects (the arrangement of pieces of a carburetor, the way in which the pieces of a dress fit together, the arrangement and fit of pieces in a structural model, the interrelationship and connection of beams and upright studs in a house frame, etc.)

25i. (S)_____ Connections and fastening of objects and parts (whether nails are strong enough, whether screw will cause wood to split, whether glue will resist moisture, whether parts should be bolted or welded, etc.)

26i. (S)_____ Appearance of assembled or constructed objects in relation to prescribed standards (whether joints are smooth, whether nail holes are hidden, whether the shape and balance of the finished object is correct, whether angles between connected parts are correct, etc.)

27i. (S)_____ Interrelation or arrangement of unconnected objects within a prescribed space or area (arrangement of patterns on a piece of sheet metal or cloth, the arrangement of shrubs or plants on a landscaped lawn, the arrangement of machines in a work space, the arrangement of furniture and other objects in a display window, etc.)

Indirect Spatial/Structural Information: Indicate the significance (to the job) of indirect spatial/structural information from the following sources:

28i. (S)_____ Drawings, plans, or diagrams pertaining to the arrangement, placement, and fastening of interconnected parts (house plans, working drawings, assembly drawings, mechanical drawings, shop drawings, etc.)

29i. (S)_____ Drawings, patterns, or diagrams pertaining to the layout or placement of unconnected parts or objects (patterns used in cutting out parts from a larger sheet of material, sketch concerning the location of objects in a room, diagram of the location of shrubs on a lawn, diagram of the placement of machines in a factory layout, etc.)

30i. (S)_____ Measuring and layout devices (squares, rulers, levels, tape measures, protractors, triangles, compasses, dividers, T-squares, etc.)

31i. (S)_____ Written material pertaining to interrelated parts and objects (building codes, instructions for assembly, written specifications, technical manuals, etc.)

32i. (S)_____ Written material pertaining to basic principles of structures (principles of stress, strain, or shear; thermal stress; properties of various types of beams; etc.)

MATERIALS INFORMATION

Information pertaining to those objects or substances which are processed, handled, used, inspected, studied, experimented with, analyzed or otherwise attended to by the incumbent. This information may be direct or indirect. Examples of materials information include information on: wood being processed, paper being cut, cloth being selected for a garment, clay being molded, earth samples being analyzed, chemical elements being experimented upon, literature concerning materials being read, metal being machined, glassware being packaged, cleaning solvent being used, etc. Examples of jobs in which information concerning materials is relevent include: carpenter, sheet metal worker, welder, machinist, painter, tailor, chef, metal casting operator, molecular physicist, chemist, etc.

Direct Sensory Information: Indicate the significance (to the job) of direct sensory information pertaining to the following aspects of materials or substances:

33i. (S)_____ Overall quality (clarity of a diamond; color, texture, and aroma of tobacco; quality of cloth; smoothness of a wine; etc.)

34i. (S)_____ Surface characteristics (color, roughness, smoothness, texture, shape, form, etc.)

35i. (S)_____ Weight: heaviness or lightness of the material

36i. (S)_____ Flavor, odor, or edibility (taste of food, fragrance of perfume, odor of a gas, edibility of food, etc.)

37i. (S)_____ Physical state: whether the material is in solid, liquid, or gaseous form

38i. (S)_____ Fragility or strength (the ability of the material to resist physical forces, susceptibility to being broken or damaged, etc.)

39i. (S)_____ Consistency: degree of firmness, viscosity or density of the material (consistency of mortar; thickness of paint; whether material is granular, lumpy, damp, dry; etc.)

40i. (S)_____ Malleability/ductility: ability to be bent, hammered, extruded, drawn, or rolled into various shapes without breaking

41i. (S)_____ Elasticity: capacity to resist deforming and recover shape quickly

42i. (S)_____ Hardness: ability to resist penetration and scratching

43i. (S)_____ Hazard: whether the material is a potential cause of bodily harm due to toxicity, causticity, sharpness, temperature, flammability, etc.

44i. (S)_____ Chemical reactivity: how material behaves chemically in the presence of other substances or elements (effectiveness of cleaning fluid, effect of acid on fabric, solubility of a material in water, susceptibility to rust, etc.)

45i. (S)_____ Conductivity: ability to conduct electricity and heat

Indirect Materials Information: Indicate the significance (to the job) of indirect information concerning materials or substances from the following sources:

46i. (S)_____ Materials measuring and testing devices (thermometers, electric strain gauge, hardness tester, roughness recorder, weighing devices, spectroscope, geiger counter, ruler, etc.)

47i. (S)_____ Symbol systems pertaining to materials or substances (chemical symbols representing different types of chemical elements, symbols for building materials, symbols for types of metals, etc.)

48i. (S)_____ Nontechnical written material pertaining to materials or substances (storage instructions, handling instructions, written warnings or descriptions from packaging labels, instructions for use, etc.)

49i. (S)_____ Technical written material concerning physical or chemical properties of materials or substances (properties-of-materials handbooks, results of materials testing, molecular structure of substances, written procedures for materials testing or analysis, etc.)

ENVIRONMENT INFORMATION

Information related to objects, materials, and conditions of the outdoor environment. Included is information pertaining to the soil, air, water, weather, and environmental emergencies such as forest fires, floods, and storms. Examples of jobs in which such information is relevant include: weather observer, conservation worker, forest ranger, agricultural agent, soil conservation worker, forest fire fighter, building contractor, farm manager, quarry foreman, geologist, plant nursery operator, horticulturist, civil engineer, ecologist, etc.

Direct Sensory Information: Indicate the significance (to the job) of direct sensory information pertaining to the following aspects of the environment:

50i. (S)_____ Plant life (crop conditions, forest conditions, plant parasites, plants and shrubs, fertilizers, etc.)

51i. (S)_____ Soil (soil types, soil conditions, erosion, drainage characteristics, etc.)

52i. (S)_____ Terrain and geological features (contour of terrain, fissures in terrain or rocks, shape of land features, rock formations, presence of minerals and rock types, ditches, fills, etc.)

53i. (S)_____ Water conditions (lakes, streams, oceans, municipal water supplies, etc.)

54i. (S)_____ Celestial objects and events (planets, stars, movement of objects in space, eclipses, meteorites, comets, etc.)

55i. (S)_____ Weather and atmospheric conditions (cloud formations, cleanliness of the air, precipitation, wind direction, etc.)

56i. (S)_____ Environmental emergencies (floods, hurricanes, forest fires, earthquakes, tornadoes, etc.)

Indirect Environmental Information: Indicate the significance (to the job) of indirect environmental information from the following sources:

57i. (S)_____ Charts or maps (meteorological charts, topographic maps, road maps, terrain maps, geological charts, aerial photographs, etc.)

58i. (S)_____ Environmental test equipment and measuring devices (bacteria count in water, sonar soundings, surveying instruments, chemical tests of soil composition, barometric readings, measurement of precipitation, water height, etc.)

59i. (S)_____ Tables and graphs (records of daily temperatures, graphs of precipitation, tables of soil characteristics, temperature conversions, etc.)

60i. (S)_____ Written material pertaining to the environment (technical journals, correspondence, log books, newsletters, etc.)

ART/DECORATIVE INFORMATION

Information pertaining to the aesthetic arrangement of substances, materials, objects, or sounds. Included is information from art objects, interior decoration, handicrafts, music, drama, dance, and other objects and events designed for aesthetic purposes. This category includes those things which might be considered to reflect "taste" or aesthetic sensitivity. Examples of jobs in which such information is relevant include: artist, sculptor, interior decorator, photograph retoucher, furniture designer, jewelry designer, architect, landscape designer, commercial artist, etc.

Direct Sensory Information: Indicate the significance (to the job) of direct sensory information pertaining to the following:

61i. (S)_____ Colors and color schemes (whether colors are tastefully arranged on a canvas, whether colors in a garment are coordinated, whether colors in a room are balanced, whether colors on retouched portraits are natural, etc.)

62i. (S)_____ Form or shape of objects (form of a piece of sculpture, form of a piece of jewelry, shape of a piece of furniture, shape of a ceramic object, etc.)

63i. (S)_____ Location of objects or people in space for aesthetic purposes (location of objects in a room, location of actors on a stage, location of figures on a canvas, arrangement of objects in a display window, etc.)

64i. (S)_____ Music (quality of the sound of a musical group, appropriateness of a particular type of music for a particular situation, tone quality and technique of a musician or singer, etc.)

65i. (S)_____ Facial expressions, body movements, speech or voice characteristics of a performer (body movements of a dancer, gestures and facial expressions of an actor, pronunciation and inflection of an entertainer, voice quality of an opera singer, etc.)

Indirect Art/Decorative Information: Indicate the significance (to the job) of indirect art/decorative information from the following sources:

66i. (S)_____ Sketches, models, or other graphic information (preliminary sketches, stage layout drawings, photographs, sketches showing locations of performers, etc.)

67i. (S)_____ Musical notation (orchestra score, part for individual instrument or singer, etc.)

68i. (S)_____ Written material pertaining to art or decorations (written descriptions of an art object, critical review of a concert, drama script, books, poetry, etc.)

BIOLOGICAL/HEALTH INFORMATION

Information relating to biology, health, or nutrition, including the functioning of life systems, anatomy and physiology, diet, food science, hygiene and sanitation, first aid and medical practices, etc. Examples of jobs in which such information is relevant include: medical technologist, nurse, physician, veterinarian, chef, biologist, dietitian, physical therapist, animal breeder, etc.

Direct Sensory Information: Indicate the significance (to the job) of direct sensory information pertaining to the following aspects of people or animals:

69i. (S)_____ Dietary needs or deficiencies (visual signs of nutritional needs such as body weight, pregnancy; skin condition; general bodily appearance; etc.)

70i. (S)_____ State of health and hygiene (broken bones, open wounds, decayed teeth, signs of disease, body cleanliness, skin disorders, bruises, etc.)

71i. (S)_____ Miscellaneous biological characteristics of people or animals (species membership, genetic abnormalities, breeding quality, age, sex, etc.)

72i. (S)_____ Gestures, sounds, or facial expressions indicating physical feelings such as pain (grimaces, groans, crying, sounds from animals, etc.)

Indicate the significance (to the job) of direct sensory information from the following types of materials, objects, or devices:

73i. (S)_____ Materials and devices related to biology or health (casts, splints, artificial limbs, electron microscope, glass slides, microtome, gauze, dental metals, etc,)

74i. (S)_____ Materials, objects, and devices related to nutrition, sanitation, or food preparation (milk pasteurization equipment, chemicals to retard spoilage, cleaning materials, food packaging materials, kitchen utensils, etc.)

Indirect Biological/Health Information: Indicate the significance (to the job) of indirect information related to biology, health, or nutrition from the following sources:

75i. (S)_____ Pictures or diagrams (X-rays, photographs, fluoroscope, medical sketches, anatomy charts, pictures of cellular structure, etc.)

76i. (S)_____ Measuring or testing devices (body temperature readings, pulse rate, blood pressure, body weight, food temperature readings, electroencephalogram, calorimeter, etc.)

77i. (S)_____ Verbal information concerning symptoms, feelings, activities, requests (patient describing symptoms, individual describing eating habits, patient requesting medication to ease pain, etc.)

78i. (S)_____ Written material pertaining to biology, health, or nutrition (patient's history, journal article, menu of prescribed food list, recipe, nutrition manual, lab report, etc.)

SEMANTIC/SYMBOLIC INFORMATION

This category includes information from words, numbers, or other symbols which the incumbent receives as written or oral/auditory input. The incumbent may be concerned with the content or meaning of the data, its adherence to symbolic and semantic rules and conventions, its format, or its accuracy. Examples of job activities in which this type of information is relevant include: a mechanic reading a technical manual for information, an accountant reading ledger accounts, a secretary taking dictation, an editor reading a manuscript for grammar and expression, a computer programmer "debugging" a program, etc.

Written Verbal Information: Indicate the significance (to the job) of the following aspects of written/verbal information:

79i. (*)_____ Content or meaning (article or report being read for information, mechanic reading technical manual for information, manuscript being edited for factual corrections, nurse reading a report of a patient's medical history, etc.). Rate the highest level of difficulty; use as a guide the examples provided for each level.

0 - No or negligible written/verbal information
1 - Very Easy (comic books, comic strips, etc.)
2 - Easy (pulp fiction, etc.)
3 - Standard (news magazines, etc.)
4 - Difficult (college history textbooks, etc.)
5 - Very Difficult (scientific journals, legal writings, etc.)

80i. (S)_____ Correspondence of contents of one manuscript or list with contents of another (whether a word is omitted from a copy, whether extra words are added to a copy, whether names on one list appear on another list, etc.)

81i. (S)_____ Format, punctuation, or spelling (whether spacing and indentation in a business letter follow accepted rules, whether words are properly spelled, whether sentences are punctuated according to accepted rules, etc.)

82i. (S)_____ Grammar or expression (whether tenses of verbs used are appropriate, whether ideas are clearly arranged and expressed, whether paragraphs are properly formed, etc.)

83i. (S)_____ Proper classification (correspondence being read for filing purposes, book titles being read for classification or cataloging purposes, articles being scanned for key reference words, etc.)

Numerical Information:

84i. (*)_____ Complexity of numbers. Rate the highest level of difficulty of numbers which provide information to the incumbent; use as a guide the examples provided for each level.

0 - Negligible information from numbers (numbers used only for classification purposes: football players' numbers, social security numbers, etc.)

1 - Natural or counting numbers (1, 2, 3, etc.)

2 - Positive and negative numbers and 0 (-2, -1, 0, 1, 2, etc.)

3 - Positive and negative fractions and decimals (-1/2, 1/4, .5, -.8, etc.)

4 - Irrational numbers ($\sqrt{2}$, π, $-\sqrt{7}$, etc.)

5 - Imaginary and complex numbers ($\sqrt{-1}$, $4\sqrt{-1}$, $\sqrt{-6}$, etc.)

85i. (*)_____ Signs and symbols representing numerical operations and relations. Rate the highest level of difficulty of signs which provide information to the incumbent; use as a guide the examples provided for each level.

0 - No information from numerical signs or symbols

1 - (+, -) addition and subtraction

2 - (x, ÷, =) multiplication, division, equality relations

3 - (2^3, $\sqrt{\ }$, <, >) exponentiation, square root, inequality relations, etc.

4 - (log, cos, tan, $\cup$, $\cap$) logarithm of a number, trig fractions, union, intersection, etc.

5 - ($\int$, Δ) integration, differentiation, etc.

86i. (*)_____ Frequency of numerical information. Rate the frequency of use of numerical information, disregarding the complexity of the information.

0 - None or negligible numerical information (unskilled construction worker, masseur, theologian, etc.)

1 - Infrequently (artist, piano tuner, night watchman, etc.)

2 - Occasionally (fire inspector, policeman, airline stewardess, etc.)

3 - Frequently (nurse, head chef, stock clerk, etc.)

4 - Very frequently (airplane pilot, bank teller, draftsman, etc.)

5 - Almost continuously (accountant, statistician, long distance operator, etc.)

87i. (S)_____ Tables and graphs (tax tables, tables of logarithms, balance sheets, tables of weights of materials, graphs, histograms, etc.)

88i. (S)_____ Information in numerical form concerning characteristics of things, events, or people (cash receipts, articles of merchandise, IQ score, length, weight, density, attendance at football games, etc.)

Pictorial and Written Symbolic Information: Indicate the significance (to the job) of visual information from the following sources:

89i. (S)_____ Diagrams, drawings, or maps (geometric shapes, flow charts, sketches, etc.)

90i. (S)_____ Special symbols (shorthand, proofreader's or editor's symbols, computer programming language, etc.)

Oral/Auditory Information: Indicate the significance (to the job) of the following types of oral/auditory information:

91i. (S)_____ Verbal information (a secretary taking dictation, a waitress taking orders in a restaurant, a bank teller opening a checking account for a customer, a nurse recording a patient's medical history, a salesman negotiating with a customer, an auto service manager hearing complaints from customers, etc.)

92i. (S)_____ Numerical or coded information (air traffic controller receiving aircraft position reports, telephone operator receiving requests for long distance phone calls, radio telegraph operator receiving Morse code, etc.)

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BUSINESS/SALES INFORMATION

Information pertaining to marketing of goods and services, business finances, business information systems, and business contacts with people. Included is information pertaining to money, merchandise, advertising, purchasing, inventory records, sales records, balance sheets, accounts ledgers, market conditions, customer satisfaction, legal procedures, etc. Jobs in which such information is relevant include: salesman, bank teller, corporation executive, hospital business manager, farm manager, service station operator, advertising manager, market analyst, accountant, corporation lawyer, insurance claims adjuster, etc.

Direct Information: Indicate the significance (to the job) of information received through direct contact with the following sources:

93i. (S)_____ Money or other medium of exchange (cash, checks, money orders, traveler's checks, etc.)

94i. (S)_____ Merchandise (food displayed for sale, dresses being counted for inventory, tractor being demonstrated to a customer, auto parts being unpacked for display, etc.)

95i. (S)_____ Advertising material (displays, signs, posters, price tags, labels, etc.)

96i. (S)_____ Customers and clients (information pertaining to customer's wishes, needs, intentions, satisfaction, etc.)

Indirect Business/Sales Information: Indicate the significance (to the job) of the following types of written or symbolic business information:

97i. (S)_____ Numerical business information (balance sheets, inventory records, sales records, production records, ledgers, budgets, stock prices, etc.)

98i. (S)_____ Business graphs, charts, or diagrams (earnings chart, sales chart, production chart, graph of projected earnings, graph of market conditions, etc.)

99i. (S)_____ Written business information (trade or technical journals, reports from subordinates, directives from supervisors or higher executives, memos, organizational procedures, etc.)

100i. (S)_____ Contracts and other legal written information (insurance contracts, lease agreements, deeds, sales contracts, other legal documents, etc.)

INFORMATION ABOUT PEOPLE AND ANIMALS

This category is concerned with information pertaining to people or animals. This may be information regarding appearance, style or grooming, motor performance, intentions, knowledge, opinions, desires, traits, habits, and other characteristics. Examples of jobs in which this information is relevant include: salesman, barber, physical education instructor, policeman, counselor, social worker, teacher, sociologist, dog show judge, animal trainer, etc.

Direct Contact Information: Indicate the significance (to the job) of information pertaining to the following aspects of people or animals resulting from direct contact with those people or animals:

101i. (S)_____ Physical condition of people (muscle tone, figure or physique, weight, etc.)

102i. (S)_____ Grooming, style, and poise of people (hair cut or hair styled, appearance of fingernails, appearance of clothing, coordination of clothing with physical attributes, posture, etc.)

103i. (S)_____ Grooming and appearance of animals (hair or fur trimmed, body proportions, manicure, color of hair or fur, etc.)

104i. (S)_____ Physical performance of people (how accurately a person can cut a piece of metal, how well a person can hit a golf ball, how well a person can dance, how accurately an individual can back a tractor-trailer truck, how fast and accurately an individual can type, etc.)

105i. (S)_____ Performance of animals (how well an animal obeys, posture, speed, jumping ability, quality of movements, etc.)

106i. (S)_____ Knowledge, verbal performance, and experience (how accurately an individual answers questions, variety of subjects an individual can discuss, how an individual deals verbally with ideas, an individual's description of events and activities in which he has participated, speaking and writing competency, etc.)

107i. (S)_____ Mood, attitudes, feelings, intentions, desires, etc. (whether a person likes or dislikes a food, whether an individual approves of a course of action, what types of hair style a person wants, how a person is likely to act, whether a person is experiencing pleasure or discomfort, etc.). The above information may be inferred from what an individual says or how he says it, as well as his expressions, gestures, and posture.

Indicate the significance (to the job) of direct information related to people from the following sources:

108i. (S)_____ Crowd situations (political rallies, movement of vehicular or pedestrian traffic, athletic events, conventions, political demonstrations or marches, etc.)

109i. (S)_____ Emergency situations involving people (fires, accidents, crimes, natural disasters, etc.)

110i. (S)_____ Habitat of people (urban environment, conditions of streets, conditions of dwellings, etc.)

111i. (S)_____ Group settings (meetings, classroom groups, conducted tour groups, group therapy, sales managers' conferences, etc.)

Indirect Information About People: Indicate the significance (to the job) of the following types of written or numerical information pertaining to people:

112i. (S)_____ Descriptions of individuals (work experience, credit record, academic record, health record, driving record, test scores, membership in organizations, activities, etc.)

113i. (S)_____ Characteristics of groups of people and people in general (buying habits, voting behavior, migration patterns, attitudes, ability patterns, history, food preferences, religious and political views, etc.)

114i. (S)_____ Descriptions of events involving people (accident reports, crime reports, news reports, description of sports or entertainment events, etc.)

115i. (S)_____ Tables, diagrams, graphs, etc., conveying information about people (population tables, tables of test scores, life expectancy tables, graphs of relation between age and income, etc.)

SENSORY CHANNEL

THIS SUBCATEGORY CONTAINS ITEMS DEALING WITH THE VARIOUS SENSORY MECHANISMS THROUGH WHICH INFORMATION IS RECEIVED.

SENSING - The process of receiving information through the various sense modalities.

Visual: Indicate the significance of the following types of vision in performance of the job:

116i. (S)_____ Near acuity: The ability to visually discriminate detail at normal reading distance or less (typist, jeweler, machinist, etc.)

117i. (S)_____ Far acuity: The ability to visually discriminate detail beyond normal reading distance (bus driver, fire lookout, umpire, land surveyor, etc.)

118i. (S)_____ Depth perception: The ability to perceive distances, such as: from the observer to an object, between objects along the observer's line of vision, from the front to the back of an object so that it is seen three-dimensionally, etc. (aircraft pilot, commercial photographer, crane operator, etc.)

119i. (S)_____ Color vision: The ability to identify and distinguish color (medical lab technician, interior decorator, television repairman, color-printing press operator, painter, etc.)

Auditory

120i. (*)_____ Auditory acuity: The ability to detect and discriminate between sounds in terms of their intensity, pitch, or tonal quality. Indicate the level of auditory acuity required in the performance of this job.

0 - None: May be adequately performed by a deaf person (produce packer, dish washer, newspaper carrier, etc.)

1 - Very low (mail carrier, chain saw operator, draftsman, etc.)

2 - Low (truck driver, television repairman, beautician, etc.)

3 - Average (bank teller, sales clerk, highway patrolman, etc.)

4 - High (telephone operator, physician, radio dispatcher, etc.)

5 - Very high (sonar operator, piano tuner, violinist, etc.)

Kinesthesis

121i. (*)_____ Indicate the extent to which the incumbent must sense movement or changes in position of his body or body parts solely from "the feel of it," that is, relying solely on the muscular, tendons, and joint senses.

0 - Kinesthetic discrimination is not required (interviewer, lobbyist, insurance salesman, etc.)

1 - Very small (disc jockey, librarian, bookkeeper, etc.)

2 - Small (machinist, mail sorter, waiter, etc.)

3 - Moderate (plumber, carpenter, auto mechanic, etc.)

4 - Great (key punch operator, trombone player, golfer, etc.)

5 - Very great (piano player, ballet dancer, juggler, etc.)

Equilibrium

122i. (*)_____ Indicate the extent to which the incumbent must attend to body balance or orientation to the upright.

0 - To a negligible extent (typist, office clerk, etc.)

1 - To a very small extent (barber, photographer, bartender, etc.)

2 - To a limited extent (waitress, surveyor, porter, etc.)

3 - To a moderate extent (house carpenter, railway switchyard worker, etc.)

4 - To a considerable extent (roofing worker, seaman, etc.)

5 - To a very great extent (ballet dancer, aerialist, steel worker walking steel beams, etc.)

Tactual Discrimination

123i. (*)_____ Indicate the level at which the incumbent must identify and/or judge the characteristics of objects with the sense of touch:

0 - Tactual discrimination is not required (insurance salesman, watchman, elementary school teacher, etc.)

1 - Very easy (draftsman, mailman, patrolman, etc.)

2 - Easy (practical nurse, house painter, produce packer, etc.)

3 - Moderate (dressmaker, carpenter, upholsterer, etc.)

4 - Difficult (auto body repairman, auto mechanic, sculptor, etc.)

5 - Very difficult (surgeon, tobacco grader, cloth examiner--hand, etc.)

Taste Discrimination

124i. (*)_____ Indicate whether the incumbent is required to identify and/or discriminate between various tastes:

0 - Does not differentiate between tastes in performance of the job

1 - Employs taste identification and/or discrimination in performance of the job (baker, narcotics investigator, wine steward, cook, bartender, chemist, etc.)

Odor Discrimination

125i. (*)_____ Indicate whether the incumbent is required to identify and/or discriminate between various odors:

0 - Does not differentiate between odors in performance of the job

1 - Employs odor identification and/or discrimination in performance of the job (meat clerk, chef, gas-meter installer, perfumer, etc.)

B. MENTAL ACTIVITIES

THIS CATEGORY OF ITEMS DEALS WITH THE MENTAL (INFORMATION-PROCESSING) ACTIVITIES REQUIRED OF THE WORKER. IT IS DIVIDED INTO FIVE ITEM GROUPS: FIGURAL INFORMATION PROCESSING, SYMBOLIC INFORMATION PROCESSING, SEMANTIC INFORMATION PROCESSING, BEHAVIORAL INFORMATION PROCESSING, AND EDUCATIONAL AND EXPERIENTIAL REQUIREMENTS.

FIGURAL INFORMATION PROCESSING

Mental activities involving the processing of information pertaining to things (for example: machines, structures, various objects being acted upon, object parts, people and animals as objects, figures and drawings, etc.).

Figural Comprehension: Recognizing, comprehending, or understanding information from objects and object systems, or from graphic and pictorial representations of objects and object systems.

1m. (S)_____ Object recognition: Visually recognizing, "making-out," or identifying objects and figures which are incomplete, vague, partially obscured, seen only at a glance, etc. Speed of recognition is important in this activity. Tests measuring this mental process often require the examinee to quickly identify drawings of objects with parts missing. (Examples of activities requiring Object Recognition: identification of types of ships or airplanes at a distance [assuming normal visual acuity], quick identification of the make and model of a car turning a corner, identification from the air of a terrain feature which is partially obscured by clouds, a sports official refereeing a football or basketball game, a wildlife manager observing animals in the woods, etc.)

2m. (S)_____ Object discovery: Visually recognizing or identifying objects and figures which appear in a complex and distracting field; recognizing objects or figures despite irrelevant and distracting information surrounding them. Tests measuring this mental process sometimes require the examinee to identify, or find, pictures or geometrical figures embedded in a complex pattern. (Examples of activities requiring Object Discovery: aerial-photograph interpreter examining a photograph for a camouflaged military installation, laboratory technician identifying types of cells under a microscope, surgeon visually identifying organs inside a patient, astronomer identifying a star in a celestial photograph, pilot identifying the location of a metropolitan airport at night from light patterns, etc.)

3m, (S)_____ Spatial orientation: Visually perceiving the arrangement of objects in three-dimensional space using one's own body as a frame of reference; maintaining orientation in relation to objects in space. (Examples of activities requiring Spatial Orientation: an airplane pilot making a visual landing, a crane operator moving a concrete slab from a truck bed to the sixth floor of a building under construction, a guide climbing a mountain, a quarterback perceiving the arrangement of players on the field while a play is in progress, a construction foreman perceiving the arrangement of beams and uprights while supervising the framing of a house, etc.)

4m. (S)_____ Object visualization: Mentally visualizing and mentally manipulating (or transforming) objects, figures, and object or figure arrangements, in space. Object Visualization differs from Spatial Orientation (Item 3m) in that in Object Visualization the observer is removed from the spatial pattern, whereas in Spatial Orientation he is the center of the pattern. A test measuring this mental process might present the examinee with a sketch of a solid form, along with diagrams of several unfolded sheets of various shapes; the examinee would be required to select from the several diagrams of unfolded sheets the one which could be folded into the prescribed form. (Examples of activities requiring Object Visualization: a dentist using a mirror to fill a tooth, a mechanic figuring out which direction a particular gear will turn if another gear in the same mechanical system turns in a clockwise direction, an architect sketching a proposed building, an artist painting a landscape, a sheet metal worker fabricating a ventilator from a set of blue prints, a surgeon visualizing what an anatomical arrangement will look like after he has removed part of an organ, etc.)

5m. (S)_____ Visual tracing: Visually exploring a wide or complicated field, especially a visual field composed of multiple pathways. This mental process is measured by tests which require quick visual scanning of pathways for the purpose of selecting the correct path; for example, finding the correct path through a paper maze. (Examples of activities requiring Visual Tracing: an electrician reading an electrical-circuit diagram, a dispatcher determining the shortest route between two points on a city map, an air-traffic controller assigning radar vectors to aircraft, etc.)

Figural Memory

6m. (S)_____ Figural memory: Mentally storing or retaining figural information for later use. Memory for object and figural form and detail; locations and positions of objects or figures; object and figural relations, arrangements, and systems; etc. (Examples of activities requiring Figural Memory: memory of shape and detail in a structure or an art object; memory of locations, distances, and directions on a map; memory of positions and interrelations of parts in a machine; memory of detail and arrangement in a blue print; memory of a diagrammed football play; memory of a machine diagram; memory of anatomical charts; memory of astronomical diagrams; etc.)

Figural Problem Solving

7m. (S)_____ Figural problem solving: Solving problems involving objects or figures where only one, or a very narrow range, of correct solutions is possible; where the criterion for success is rather sharply defined. This type of mental activity involves the process of deducing or converging ("zeroing-in") on correct solutions to problems; explicit rules are sometimes applied in this process. (Examples of activities requiring Figural Problem Solving: figuring out how to assemble the parts of a mechanical device or a prefabricated structure; solving a jig-saw puzzle; figuring out how to attach a part to a mechanical device; figuring out complex interrelationships among gears, wheels, pulleys, or levers; surgeon deciding how to cut and suture when extracting an organ or tumor; dentist deciding how a tooth should be filled; etc.)

Figural Ingenuity

8m. (S)_____ Figural ingenuity: Creative, innovative, resourceful, or flexible thinking pertaining to objects, figures, and object or figure systems; creative use of information from objects, figures, or shapes. In contrast to Figural Problem Solving (Item 7m), Figural Ingenuity usually occurs in situations where the range of possible solutions is rather broad, where the criteria for success are not sharply defined, and where variety or novelty of solutions is important. Figural Ingenuity might involve: the creation of new shapes, forms, or patterns; new ways of arranging objects; new or modified forms of object interactions or systems; etc. Tests which measure this mental process usually stress variety, originality, and quantity of solutions, and the readiness to change one's direction of thinking. (Examples of activities involving Figural Ingenuity: an artist or a sculptor producing an original piece of art, an architect designing an unusual building, a mechanical engineer designing a new mechanical device or making improvisations in an existing mechanical device or system, a choreographer devising an elaborate dance routine, a professional football coach sketching a new play, a package designer designing package exteriors for retail products, etc.)

Figural Evaluation: Judgment or evaluation of objects and figures; judging objects and figures against standards.

9m. (S)_____ Form perception: Visually finding or identifying pertinent detail in objects or in pictorial or graphic material; making fine comparisons and discriminations among characteristics such as shapes, shadings, line widths, and other detail in objects or figures. Speed is an important factor in Form Perception; tests measuring this mental process often require the examinee to compare and match detailed geometrical figures or pictures under speed conditions. (Examples of activities requiring Form Perception: a fingerprint classifier comparing fingerprints, an aerial-photograph interpreter examining aerial photographs, a topographical draftsman distinguishing terrain features on maps, a gemologist examining a diamond for flaws, a physician examining an X-ray to determine if a bone is fractured, a garment inspector checking articles for fabric flaws, etc.)

10m. (S)_____ Aesthetic judgment: Making visual judgments and evaluations of art and other aesthetic objects on the basis of variations in unity, proportion, form, color, arrangement or interrelationships, etc. (Examples of activities requiring Aesthetic Judgment: an art teacher evaluating a student's work; an art appraiser determining the value of a painting; an artist painting a picture; a sculptor carving a design in stone; an architect judging the aesthetic quality of a building design; a dress designer judging the aesthetic appeal of a garment; an interior decorator deciding on the appropriate decor for a room; an advertising lay-out man arranging drawings and photographs for advertising layouts in newspapers, magazines; etc.)

SYMBOLIC INFORMATION PROCESSING

Mental activities involving the processing of information from symbols, signs, or codes--such as numbers, letters, musical notations, mathematical symbols, etc. Symbolic information differs from semantic (or verbal) information in that symbols typically have no "meaning" in and of themselves (they are signs that can be used to stand for something else), whereas words (semantic information) are very closely attached to meanings or referents.

Symbolic Comprehension: Recognizing, comprehending, or understanding symbolic information.

11m. (S)_____ Spelling: Identifying misspelled words, distinguishing between properly spelled and misspelled words, and using letters to form properly spelled words (this is not a semantic activity, since the emphasis is on the proper arrangement of letters in words, rather than the meanings of the words themselves). (Examples of activities requiring Spelling: a proofreader checking typed script, a secretary checking a letter before it goes out, a a stenographer typing a letter from shorthand, a technical writer preparing a report, etc.)

12m. (S)_____ Comprehension of symbolic procedures: Comprehending or understanding symbolic relations, manipulations, and solutions when they are presented; recognizing that various symbolic operations lead to specified results or conclusions. For example, understanding relations such as b/y, $a = xy$, $b = x/y$, $\tan \theta = \sin \theta/\cos \theta$, etc. Also, comprehending symbolic implications and systems such as: $a^3 = a \times a \times a$; $x^2 - 7x + 12 = 0$; that if $a + b = 9$, then $b = 9 - a$; that $(x + a)^2 = x^2 + 2a\,x + a^2$; that if $a>b>d$ and $a>c>b$, then $c>d$; that $\sqrt{63} = 3\sqrt{7}$; etc. It can be seen that this mental process would be involved in understanding mathematical procedures, especially those involving equations (e.g., algebra, trigonometry, and calculus). (Examples of activities requiring Comprehension of Symbolic Procedures: a civil engineer reading trigonometric equations; an electronic technician reading equations dealing with current voltage and resistance; a physical chemist reading equations representing an electrochemical process; an agronomist reading statistical equations; an accountant reading a new tax formula; an aeronautical technician reading equations dealing with the relationship of load capacity to weight factors, centers of gravity, and other items; etc.)

13m. (S)_____ Symbolic induction: Finding the rules or principles underlying specific sets of symbolic data. Tests measuring this mental process often require examinees to discover the rules by which given groups or sequences of symbols are formed. For example, given the letter sets ABC, MNO, XYZ, PQS, GHI, discovering that PQS is different from the others, since the rule for the formation of the other letter sets is alphabetical order; or, given the number series 16, 32, 8, 16, 4, 8, 2, discovering that this series was formed by the arithmetic operations x2, ÷4. (Examples of activities requiring Symbolic Induction: a cryptographer breaking a coded message, an archaeologist attempting to translate writings in an ancient language, a theoretical physicist developing an explanation for observed relationships in his data, an economist forming a hypothesis based on examination of financial data, etc.)

Symbolic Memory

14m. (S)_____ Symbolic memory: Mentally storing or retaining symbolic information for relatively short periods of time. Tests measuring this mental process often require examinees to memorize lists of numbers of nonsense words, sequences of numbers, number-letter pairs, etc.; examinees are tested for recall within a few minutes after exposure to the material. (Examples of activities requiring Symbolic Memory: a telephone operator remembering telephone numbers and names of people, a taxicab driver remembering dispatch addresses, an air-traffic control operator remembering aircraft call signs, a grocery store checkout cashier remembering prices of the day's specials, a basketball announcer remembering players' names and numbers, etc.)

Symbolic Problem Solving: Solving problems involving symbols where only one or a very narrow range of correct solutions is possible.

15m. (S)_____ Numerical computation: Obtaining correct solutions by applying the appropriate rules and operations to numbers, including such tasks as arithmetical computation, solving simple arithmetical and algebraic equations, etc. Tests measuring this mental process require examinees to perform basic numerical operations (+, -, x, ÷) and to solve simple arithmetical equations (such as: 4 - 5 + 6 = ?) under time restrictions. (Examples of activities requiring Numerical Computation: an insurance underwriter computing compound interest and premium rates, a chemist computing the answer to a mathematical equation, a bookkeeper adding and subtracting debits and credits, a draftsman computing scale representations of objects, a surveyor calculating the acreage of a farm, a stock broker computing the cost of a securities transaction, a carpet estimator computing the amount of carpet needed for a job, etc.)

Symbolic Productivity: Resourceful or flexible thinking involving symbolic information, in situations where the range of possible alternatives or solutions is rather broad.

18m. (S)_____ Word fluency: Producing words which meet prescribed phonetic or structural criteria, where the meanings of such words are not of primary importance. Tests measuring this mental process might ask the examinee to perform under time restrictions tasks such as these: write as many words as you can beginning with the letter "R"; write as many words as you can which rhyme with the word "spoon"; write as many words as you can ending in "tion." (Examples of activities requiring Word Fluency: a song writer searching for a word with the correct sound and number of syllables, a poet searching for a word which rhymes with a preceding word in a poem, an advertising writer searching for an appropriate word to fit into a commercial jingle, a political speech writer producing such alliterations as "nattering nabobs of negativism," etc.)

19m. (S)_____ Symbolic generation: Starting with given symbolic systems (for example, mathematical equations), generating from them new or transformed systems, in situations where several or more derivations are possible; drawing multiple deductions from symbolic systems. For example, if given the equations

$$Y + 4 = Z - 9$$
$$Y + Z = 4X$$

being able to derive from these a number of new equations, such as: $Y = Z - 13$; $Y = 4X - Z$; $2(Z - 2X) = 13$; etc. Symbolic Generation involves the process of Symbolic Deduction (Item 16m) but is more complex than this latter process, since it occurs in situations where numerous deductions are possible. (Examples of activities requiring Symbolic Generation: a mathematician deriving new equations, a chemist deriving new formulas for compounds and reactions, a theoretical physicist formulating mathematical models of matter-energy interaction, a mathematical statistician developing a new statistical model, an engineering analyst developing a mathematical simulation of a physical system, a systems programmer developing a new computer language, etc.)

16m. (S)_____ Symbolic deduction: Applying premises, rules, and operations to symbolic systems in order to arrive at correct answers or solutions (for example, solving mathematical equations, or applying rules and operations to other types of symbolic formulas). The process of Symbolic Deduction goes beyond the Comprehension of Symbolic Procedures (Item 12m) in that it requires the active solution of problems. Tests measuring this mental process might include items such as the following:

If

(o) + (*) = (#)
(ç) + (#) = ($)
(ç) + (*) = (o)
(o) + (#) = (@)

What does (ç) + (*) + (#) equal?
[answer: (@)]

(Examples of activities requiring Symbolic Deduction: a civil engineering technician using trigonometry to calculate stress factors, an electronics technician calculating the phase relationship between current and voltage, an architectural technician calculating the area of an elliptical arch, an aerospace engineer calculating the lift factor for various wing configurations, an agronomist applying a statistical formula to his data, etc.)

17m. (S)_____ Symbolic operations sequencing: Determining the appropriate sequence in which symbolic operations (usually mathematical) should occur to arrive at a correct result or solution; ordering symbolic operations into proper steps. Tests measuring this mental process might include items such as the following: starting with the number 6, how would you obtain 18, using the operations +3, ÷2, and x3; that is, in what order should these operations be performed? (answer: ÷2, +3, and x3). This process might also be referred to as "symbolic planning"; it goes beyond the ability to perform individual operations (as in Numerical Computation, Item 15m), since it involves the correct sequencing of several operations to attain a goal. (Examples of activities requiring Symbolic Operations Sequencing: a computer programmer determining the sequence of operations required to perform a specified data-processing task, an industrial engineer determining the sequence of mathematical operations required to solve a systems problem, an actuary outlining the sequence of operations required to process accident data, a systems analyst arranging the steps in a procedure for processing inventory data, a statistician arranging the computational steps in a data-analysis problem, etc.)

Symbolic Evaluation: Judgment or evaluation of symbolic information in terms of specified criteria or standards.

20m. (S)_____ Clerical perception: Rapidly perceiving pertinent detail in written material (either verbal or symbolic) and rapidly performing simple discriminations or comparisons with written material, where the emphasis is on symbolic arrangement rather than on the meaning of the material. Tests measuring this mental process often require the examinee to rapidly compare two lists of names and numbers and identify discrepancies between items in the two lists. For example:

7410937 ——— 7410927

James W. Cannon ——— James W. Cannon

WDNTYOR ——— WDNTYUR

(Examples of activities requiring Clerical Perception: a proofreader checking a proof against the original copy, a stenographer typing a letter from shorthand notes, a bookkeeping machine operator transposing information from sales slips or invoices to the machine, etc.)

21m. (S)_____ Evaluation of symbolic procedures: Judging whether or not symbolic manipulations, solutions, or conclusions are correct, valid, or applicable. For example: (1) given $2a>4b>2c$, indicate whether the conclusions that $a = c$, $b<a$, $c = b$ are true, false, or uncertain (answer: false, true, and uncertain, in that order); (2) does $(x + a)^2 = x^2 - 2ax + a^2$? (answer: false); (3) if $\frac{3x}{} - 12 = 6$, does $x = 6$? (answer: true); (4) does $(72 \div 2) + \sqrt{64} - 4^2 = 28$? (answer: false). (Examples of activities requiring Evaluation of Symbolic Procedures: an auditor checking a set of bookkeeping computations, a mathematics teacher checking solutions to algebraic problems, a computer programmer debugging a faulty program, a mechanical technician checking computations on machine performance data, a research chemist checking the derivation of a formula, etc.)

SEMANTIC INFORMATION PROCESSING

Mental activities involving the processing of verbal information or information to which words are commonly attached; verbal thinking.

Semantic Comprehension: Comprehending or understanding information to which words are commonly attached.

22m. (S)_____ Verbal comprehension: Comprehending or understanding written and spoken words; also judging whether or not words are appropriately used. This mental process is based upon the size of one's listening and reading vocabulary. Tests measuring verbal comprehension typically require the examinee to identify the meanings of words. For example, which of the following words is most similar in meaning to the word EXORBITANT: (a) refreshing, (b) jovial, (c) excessive, (d) dishonest, (e) uncouth? (Answer: c). (Examples of activities requiring Verbal Comprehension: an attorney reading a corporate contract, a news reporter covering a political debate, an economist listening to the presentation of a professional paper, a college instructor reading a historical article, a magazine editor reviewing an article for publication, etc.)

23m. (S)_____ Problem comprehension: Understanding the structure of problems which are stated (or expressible) in words. One test measuring this mental process requires the examinee to select the operations he would perform to solve a verbally-stated problem. For example, "A sheet of plywood 4 feet wide and 8 feet long costs $5.98. Which of the following operations would you perform in order to determine the cost per square foot: (a) divide and multiply, (b) multiply and divide, (c) multiply and subtract, (d) add and multiply, (e) add and divide?" (Answer: b). (Note that this problem is verbally stated and requires no arithmetic calculations; the crucial requirement is <u>understanding</u> the structure of the problem.) Another test of Problem Comprehension requires the examinee to figure the effective distance (distance in terms of time) of a ship from port using information about wind direction, current direction, and the effective distances to add (or subtract) when the ship is going against (or with) the wind and/or current--with emphasis directed toward understanding, or structuring, the problem rather than on computation. (Examples of activities requiring Problem Comprehension: a city planner considering an area traffic problem, a school principal dealing with the problem of lunch scheduling, a biologist examining a research problem, a hospital dietician formulating a meal-planning problem, a building contractor determining the quantity of various materials needed for a job, etc.)

24m. (S)_____ Problem detection: Recognizing or identifying practical problems and potential causes and effects, especially in verbally-described plans or situations; seeing deficiencies in or potential outcomes of proposed courses of action. For example: seeing that a road should not be paved when it would have to be torn up in the near future to install new sewer pipes; recognizing that it would be unwise to develop a high-priced housing subdivision near an industrial area because of the undesirability of the location; etc. (Examples of activities requiring Problem Detection: an industrial consultant investigating decreased production in a company, a high school teacher trying to anticipate the problems that would arise on a planned class trip, a sales manager reviewing plans for promoting a product, a police chief reviewing a security system for a visiting dignitary, a plant manager anticipating problems related to moving equipment into a new building, etc.)

Semantic Memory: Memory of information to which words are commonly attached. Such information may or may not be originally received in verbal form (though it often is), but it must be of a type which can be recalled or reproduced in verbal form.

25m. (S)_____ Memory of unitary ideas: Mentally storing or retaining separate, sequentially unrelated ideas for later recall (usually verbal recall). For example, verbally reproducing as many ideas as one can recall from a book, a motion picture, a conversation, etc., where there is no requirement that the ideas be arranged in any particular order or sequence. (Examples of activities requiring Memory of Unitary Ideas: a news reporter remembering ideas discussed in a personal interview with a celebrity, an advertising executive remembering ideas he has read about in various professional magazines, a supervisor remembering ideas acquired at a human-relations workshop, an office manager remembering ideas which were discussed in a departmental meeting, a psychologist remembering a number of basic ideas from a recently-read book on human motivation, etc.)

26m. (S)_____ Memory of idea sequences: Mentally storing or retaining sequentially related ideas for later recall; retaining and recalling ideas in a specified order. For example, remembering instructions which must be carried out in a particular order, remembering the order in which events one has witnessed or read about occurred, remembering an argument or proposition consisting of logically-related ideas, etc. This process applies primarily to new or infrequently used information, rather than to information used so frequently that it is habitual or permanently "stamped in." (Examples of activities requiring Memory of Idea Sequences: an attorney remembering the sequence of ideas in a legal argument he is presenting, a policeman reporting a sequence of events he has witnessed, a college instructor remembering an outline and sequence of ideas for a lecture he is presenting, a construction foreman remembering instructions involving a sequence of steps or operations, etc.)

27m. (S)_____ Memory of associated ideas: Remembering facts or characteristics associated with people, places, things, etc. (Examples of activities requiring Memory of Associated Ideas: a sports writer recalling facts about different athletes, a salesman remembering information about his products and about the preferences and backgrounds of his regular customers, a travel agent remembering facts about countries and steamship lines, a historian remembering facts about people in history, a hotel social director remembering information about the interests and backgrounds of various guests, etc.)

Semantic Problem Solving: Solving semantic (verbally-expressed) problems where only one, or a relatively narrow range, of correct solutions is possible; where the standard of success is rather sharply defined.

28m. (S)_____ Deductive reasoning: Reasoning from given premises to their necessary conclusions; reasoning that if certain conditions hold or exist, then other specified conditions must follow. Also, evaluating the validity or truth of such conclusions drawn by others. Tests measuring this mental process often require the examinee to draw the appropriate conclusion from a set of stated conditions or premises. For example, given the premises (1) "No one works on holidays" and (2) "Some people work on Sundays," drawing the conclusion that "Sundays are not holidays." (Examples of activities requiring Deductive Reasoning: a district attorney preparing an argument to a jury, a scientist deriving predictions from a set of theoretical postulates, a politician pointing to a fallacy in an argument presented by his opponent, an economist presenting the theoretical rationale for a proposed solution to inflation, etc.)

29m. (S)_____ Plan ordering: Arranging (in plan form) events, operations, or details into their proper order or relationship for the purpose of accomplishing some goal. Tests measuring this mental process sometimes require the examinee to arrange a randomly-presented set of described operations or events into the order necessary to accomplish a specified goal. For example, the examinee might be asked to indicate the order for seven described steps in changing a flat tire. (Examples of activities requiring Plan Ordering: a building contractor preparing a schedule for various sub-contracted jobs on a house, such as roofing, plumbing, and wiring; a campaign manager planning a candidate's itinerary; an educator determining the order in which courses should be offered or taken in a new curriculum; a marketing manager arranging the steps in a promotional campaign; a chef planning the order of operations for the preparation of a state dinner; a plant production manager planning the best order of operations for meeting a production goal; etc.)

Semantic Productivity: Resourceful or flexible verbal thinking in situations where the range of possible alternatives or solutions is rather broad, where there is no one correct or best solution.

30m. (S)_____ Idea originality: Producing clever, novel, or uncommon ideas. Tests measuring this mental process might require the examinee to produce clever titles for story plots, to write punch lines for cartoons, or to list all the novel consequences he can think of which would result from some unusual event (for example, "What would be the results if the human sex drive were to suddenly disappear?"). (Examples of activities requiring Idea Originality: an advertising manager producing a new twist for a TV commercial, a cartoonist creating a satirical cartoon, a mystery writer inventing an unusual plot for a story, a TV script writer thinking up a punch line for a joke, a marketing manager thinking of an unusual name for a new product, a psychologist devising a novel explanation for violent behavior, an architect creating a new concept in the design of future cities, etc.)

31m. (S)_____ Idea production: Rapidly producing or calling up appropriate ideas about a given subject, where quantity and relevance rather than originality of ideas is stressed (compare with Idea Originality, Item 30m) and where the ideas themselves--and not the verbal facility with which the ideas are expressed (see Idea Expression, Item 32m)--are the important factor. Tests measuring this mental process usually present the examinee with a topic and require him to write down, under a time limit, as many relevant ideas about the subject as he can. For example, the examinee might be asked to write down as many ideas as he can about the topic "a trip on an airplane"; to write down as many things as he can think of that fall into the category "round"; or to describe as fully as he can a picture which he is shown. (Examples of activities requiring Idea Production: an automobile designer coming up with ideas concerning a new model during a "brainstorming" session, an advertising agent offering ideas and suggestions for a new mailer, a vocational counselor describing various aspects of an occupation when asked by a student, a mechanical engineer describing all of the relevant characteristics of a new engine when questioned by his supervisor, etc.)

32m. (S)_____ Idea expression: Rapidly and fluently putting ideas into words in oral or written connected discourse; constructing sentences to express ideas. Idea Expression differs from Idea Production (Item 31m) in that Idea Expression does not involve coming up with ideas but, rather, facility in the verbal expression of these ideas. Tests measuring this mental process might require the examinee to write, under a time limit, a theme on a particular subject; to restate a given idea in a number of different ways; or to construct sentences under a time limit. (Examples of activities requiring Idea Expression: a lawyer questioning a witness, a newspaper reporter writing an article, a politician in a televised debate, a business executive dictating a letter, a researcher writing a technical report or proposal under a deadline, a radio sports announcer broadcasting a football game, etc.)

33m. (S)_____ Idea flexibility: Producing a variety of different ideas (usually verbally expressed) in a problem situation; looking at a verbally-stated problem in a number of different ways, as opposed to sticking to one idea or way of viewing the problem; changing one's mental set in a problem situation. A test measuring this mental process might ask the examinee to state as many different uses as he can for a common object such as "a shoe." The examinee's score would be based on the number of times he switched to a new kind of idea; for example, the responses "to throw at a cat" and "to throw at a dog" fall into the same idea category and would only count once, whereas "use as a hammer" falls into a different category and would add another point to the score. (Examples of activities requiring Idea Flexibility: a product developer thinking of different uses for a new synthetic material, a writer considering alternative ways of ending a story, a high school principal thinking of different ways of handling discipline problems, a real estate developer thinking of different uses for a tract of land, an architect thinking of different ways to design a building, etc.)

34m. (S)_____ Plan elaboration: Thinking of necessary details for the development of a plan to accomplish a goal or deal with a problem. A test measuring this mental process might present the examinee with a brief outline of a plan to deal with some specified problem, and ask him to fill in all the details he thinks necessary to make the plan feasible and complete; or, the examinee might be presented with a stated problem and asked to write down all the details he thinks necessary for dealing with the problem. (In both cases, the examinee would be scored on the number or relevant details listed.) (Examples of activities requiring Plan Elaboration: an agricultural scientist thinking of the necessary details for carrying out a proposed research project, a plant manager thinking of the details involved in carrying out a planned production change, a camp director thinking of the details necessary for carrying out the operations of a six-week summer program, a college instructor thinking of the details in the preparation of a new course, a sales manager planning a promotional campaign, etc.)

35m. (S)_____ Associational fluency: Rapidly producing (or coming up with) words which are similar or opposite in meaning to some specified word; producing synonyms and antonyms. Tests measuring this mental process sometimes present the examinee with one word at a time and require him to write as many words as he can that have meanings either similar or opposite to the specified word. For example, "write as many words as you can similar in meaning to the word 'weak.'" (Examples of activities requiring Associational Fluency: a historical novelist searching for alternative words referring to the same concept in order to avoid undue repetition, a paid speaker using a variety of words in order to maintain the interest of his audience, a publishing company representative conversing with members of a university faculty concerning textbooks which his company has to offer, a literary critic writing a book review, an editorialist writing a political commentary, etc.)

36m. (S)_____ Verbal construction: Constructing sentences and paragraphs which are grammatically, structurally, and punctuationally correct; properly arranging words into phrases, sentences, and paragraphs. Also, judging the grammatical and structural correctness of the verbal output of others. (Examples of activities requiring Verbal Construction: an advertising writer preparing an ad, a technical writer preparing a report, an editor reviewing a manuscript, a corporation president giving a press interview, a high school principal preparing a speech to the PTA, a legal secretary making grammatical and punctuational corrections in letters, etc.)

BEHAVIORAL INFORMATION PROCESSING

Mental activities involving the processing of information conveyed by the expressive behaviors of other persons--such as facial expressions, body movements, postures, gestures, tones of voice, etc. Such information serves as a basis for social perception on the part of the observer.

37m. (S)_____ Person perception: Interpreting another individual's expressive behavior; drawing inferences about his current mental state--his thoughts, feelings, mood, desires, intentions, etc. Person Perception occurs during face-to-face contact with other individuals. Tests measuring this mental process require the examinee to interpret pictures of different facial expressions, body postures, and gestures. (Examples of activities requiring Person Perception: a clergyman counseling a parishioner, an automobile salesman sizing up a customer, a school counselor helping a student with a personal problem, a policeman questioning a suspect, a psychiatric social worker interviewing a client, a personnel manager conferring with a union official, etc.)

38m. (S)_____ Group perception: Comprehending situations in which two or more individuals (in addition to the observer) are interacting; sizing up group situations. A test measuring this mental process might require the examinee to interpret a sequence of pictures depicting scenes in a group episode. (Examples of activities requiring Group Perception: a psychologist conducting a sensitivity training session, a recreation leader supervising a boys' camping trip, an office manager supervising a typing pool, a social group worker directing activities at a community center, an elementary school teacher supervising a group project, a power-line foreman supervising a line crew, etc.)

EDUCATIONAL AND EXPERIENTIAL REQUIREMENTS

This group of items deals with the education and work experience required by the job.

39m. (*)_____ Educational level: Indicate the amount of formal education (public and private schools, colleges, and universities) typically required for entry into this job. Do not consider specific vocational preparation (vocational education, apprentice training, in-plant training, etc.) in this rating.

0 - Less than an 8th-grade education

1 - 8 to 12 years of education (without a high school diploma)

2 - A high school diploma

3 - 2 to 4 years of college (without a degree)

4 - A bachelor's degree (B.S., B.A., A.B., etc.)

5 - A graduate degree (M.S., M.Ed., Ph.D., D.D.S., M.D., Ed.D., L.L.D., D.V.M., etc.)

40m. (*)_____ Job-related preparation: Indicate the amount of specific vocational preparation (vocational and technical school, apprentice training, in-plant training, on-the-job training, etc.) required for adequate performance of the job. Do not include degree-granting programs (medical school, dental school, engineering school, etc.) or career progression (previously held jobs) in this rating.

0 - None or short demonstration only

1 - 1 to 30 days

2 - 1 to 6 months

3 - Over 6 but less than 12 months

4 - 1 to 2 years

5 - Over 2 years

41m. (*)_____ Work experience: Indicate the amount of essential work experience (previous experience in less responsible, lower-level, or related jobs) typically required for this job. This item deals with career progression; for example, certain types of work experience might be required for selection or promotion to a managerial position.

0 - Entry-level job; no work experience required

1 - Less than 3 months

2 - 3 to 12 months

3 - 13 months to 3 years

4 - Over 3 but less than 5 years

5 - Over 5 years

C. WORK BEHAVIOR

THIS CATEGORY OF ITEMS DEALS WITH THE ACTIVITIES REQUIRED OF WORKERS BY THEIR JOBS. IT IS DIVIDED INTO THREE MAJOR SUBCATEGORIES: PHYSICAL WORK BEHAVIOR, REPRESENTATIONAL WORK BEHAVIOR, AND INTERPERSONAL WORK BEHAVIOR. ONE OF THESE SUBCATEGORIES WILL PROBABLY BE MORE RELEVANT THAN THE OTHERS TO THE JOB YOU ARE RATING. HOWEVER, NEARLY ALL JOBS HAVE ASPECTS WHICH RELATE TO ALL THREE SUBCATEGORIES; THEREFORE, FOR ANY JOB, EVERY ITEM IN ALL THREE SUBCATEGORIES SHOULD BE READ AND CONSIDERED.

PHYSICAL WORK BEHAVIOR

THE ITEMS IN THIS SUBCATEGORY DEAL WITH MANUAL WORK ACTIVITIES. THERE ARE THREE SECTIONS OF ITEMS: TOOL, MACHINE, AND EQUIPMENT USAGE; GENERAL PHYSICAL REQUIREMENTS AND WORK ACTIVITIES; AND OBJECTS ACTED UPON.

Tool, Machine, and Equipment Usage

This section of items deals with the various equipment the worker uses in performing his job. The items are arranged in seven categories:

Non-Powered Hand Tools

Portable Powered Tools/Equipment

Portable Non-Powered Equipment

Stationary Machines and Equipment

Mechanized Equipment

Setting/Control Devices

Measurement, Layout, and Scientific Devices

NON-POWERED HAND TOOLS

Any implements which when in use are held with one or both hands, are non-powered, and are used to do work on, to handle, or to facilitate working on objects (including people and animals) or materials. A tool is considered non-powered only if it has no energy source (electric, pneumatic, gasoline, etc.) either internally or externally supplied, which provides force, heat, light, pressure, etc. For example, a paint brush is non-powered, but an aerosol can is powered. Classes of tool functions are listed below with examples of specific tools which are used to perform each function. Consider for each function whether or not the worker uses a non-powered hand tool to perform that function. Then assign a rating on the significance of each tool function to the job.

Material Parting

1t. (S)_____ Cutting by sawing (hacksaw, handsaw, coping saw, surgical saw, etc.)

2t. (S)_____ Cutting by shearing (tin snips, wire cutters, scissors, etc.)

3t. (S)_____ Cutting by blade (knife, axe, scalpel, razor, etc.)

4t. (S)_____ Cutting by abrasion (jeweler's saw, file, etc.)

Material Joining

5t. (S)_____ Bonding/sealing (glue brush, trowel, caulking gun, putty knife, etc.)

6t. (S)_____ Mechanical fastening (screwdriver, wrench, hammer, hand stapler, etc.)

7t. (S)_____ Stitching/wiring (wire pliers, needle and thread, sutures and forceps, baling wire fastener, etc.)

Surface Preparation

8t. (S)_____ Liquid application/coating (paint brush, paint roller, manual highway line painter, medicine dauber, etc.)

9t. (S)_____ Abrading/polishing (hand sander, polishing mitt, etc.)

10t. (S)_____ Scraping (scraper, putty knife, etc.)

Forming

11t. (S)_____ Forming (flask, mold, modeling knives, etc.)

Shaping

12t. (S)_____ Shaping (chisel and mallet, wood plane, file, rabbit plane, router plane, hand pipe threader, etc.)

13t. (S)_____ Perforating/boring (hand drill, brace and bit, auger, awl, punch, etc.)

Handling/Cleaning/Earth Working

14t. (S)_____ Handling (tongs, pliers, forceps, stevedore hook, dipper, ladle, cant hook, pike, etc.)

15t. (S)_____ Cleaning (mop, broom, squeegee, sponges, scrub brush, chamois, duster, etc.)

16t. (S)_____ Earth working (rake, hoe, shovel, pick, gardener's hand spade, posthole digger, tamp, etc.)

Sporting Equipment

17t. (S)_____ Sporting equipment (baseball bat and glove, hockey stick, polo stick, etc.)

Medical Devices, not elsewhere defined

18t. (S)_____ Medical devices (hemostat, clamps, probe, blood pressure cuff, syringe, stethescope, tongue depresser, etc.)

Other Hand Tools

19t. (S)_____ (Write in _____)

Precision in non-powered hand tool usage: Precision involves close attention to physical detail, along with steadiness and sureness of hand.

20t. (*)_____ Indicate using the scale below the highest degree of precision required of the worker in using any non-powered hand tool.

0 - Does not apply; worker uses no hand tools

1 - A very slight degree (raking leaves, digging post-holes, etc.)

2 - A small degree (wiring a house, driving nails, etc.)

3 - A moderate degree (cutting patterns in sheet metal using hand tin snips, using a wood plane, etc.)

4 - A high degree (chiseling by hand a decorative pattern in wood, pouring acid into a test tube, etc.)

5 - A very high degree (repairing a watch by replacing the mainspring, drawing blood from the vein of a medical patient, cutting cell sections under a microscope, etc.)

PORTABLE POWERED TOOLS/EQUIPMENT

Any implements which are used to do work on, apply energy to, or to handle objects (including people), or materials, which are powered, and which the worker normally moves around from place to place. A tool is considered to be powered if it has some source of energy (electric, pneumatic, gasoline, etc.) either internally or externally supplied, which produces force, heat, light, pressure, etc. In this context, for example, an aerosol can, as well as an electrically powered drill, is considered powered. Classes of tool/equipment functions are listed below with examples of specific tools and equipment which are used in performing each function. Consider for each function whether or not the worker uses a tool or piece of equipment which performs that function. Then assign a rating on the significance of each equipment function to the job.

Material Parting

21t. (S)_____ Cutting by sawing (power circular saw, reciprocating saw, chain saw, saber saw, etc.)

22t. (S)_____ Cutting by shearing (electric hedge clippers, barber clippers, sheet metal nibblers, etc.)

23t. (S)_____ Cutting by blade (electric meat knife, fabric knife, power mower, etc.)

24t. (S)_____ Cutting by abrasion (diamond wheel, carbide wheel, etc.)

25t. (S)_____ Cutting by heat (oxyacetelene torch, arc cutter, etc.)

Material Joining

26t. (S)_____ Fusion (gas welder, arc welder, soldering gun, etc.)

27t. (S)_____ Bonding (electronic wood welder, hot glue gun, etc.)

28t. (S)_____ Stitching (hand buttonholer/sewer, electric hand seamer, etc.)

29t. (S)_____ Mechanical fastening (pneumatic nailer, electric stapler, riveting gun, air wrench, power screwdriver, etc.)

Surface Preparation

30t. (S)_____ Liquid application/coating (paint spray gun, aerosol paint can, etc.)

31t. (S)_____ Abrading/polishing (sand blaster, power belt or pad sander, buffing wheel, floor polisher, buffer, etc.)

32t. (S)_____ Scraping (power scraper, etc.)

Shaping

33t. (S)_____ Perforating/boring (electric power drill, dentist's drill, etc.)

34t. (S)_____ Shaping (router, power chisel, pipe threader, portable power plane, etc.)

35t. (S)_____ Grinding (portable surface grinder, tool sharpener, etc.)

Combining/Separating

36t. (S)_____ Combining/separating (electric hand mixer, concrete screeter, etc.)

Earth Working

37t. (S)_____ Earth working (sample borer, power posthole digger, air hammer, etc.)

Sporting Equipment, Powered

38t. (S)_____ Sporting equipment (hunting rifle, starter's gun, etc.)

Medical Equipment, not elsewhere defined

39t. (S)_____ Medical equipment, powered (venticular defibrillator, portable cardiogram machine, cautery, etc.)

Other Portable Powered Tools

40t. (S)_____ (Write in _____)

Precision in portable powered tool/equipment usage: Precision involves close attention to physical detail, along with steadiness and sureness of hand.

41t. (*)_____ Indicate using the scale below the highest degree of precision required of the worker in using any portable powered tool/equipment.

0 - Does not apply; worker uses no portable powered tools/equipment

1 - A very slight degree (cutting grass with a power mower, cutting logs with a chain saw, etc.)

2 - A small degree (painting a wall with a spray gun, using a power disc sander in auto body repair, etc.)

3 - A moderate degree (cutting hair with barber clippers, sewing seams with a sewing machine, etc.)

4 - A high degree (welding two pieces of angle iron at right angles using an electric arc welding unit, cauterizing tissue with a hot iron, etc.)

5 - A very high degree (soldering electronic parts into a transistor radio, drilling out a tooth cavity with a dentist's drill, etc.)

PORTABLE NON-POWERED EQUIPMENT

Any non-powered pieces of equipment, which are neither hand tools nor portable power tools/equipment, which are used to handle or support objects/materials or otherwise aid the worker in performing his job. Five non-powered equipment functions are listed below with specific examples of equipment used in performing each function. Consider for each function whether or not the worker uses a piece of equipment which performs that function. Then assign a rating on the significance of each equipment function to the job.

42t. (S)_____ Holding (clamps, jigs, fixtures, etc.)

43t. (S)_____ Supporting (ladder, car jack, block and tackle, cable-jack, etc.)

44t. (S)_____ Work aids (anvil, oil can, etc.)

45t. (S)_____ Non-powered wheeled equipment (wheelbarrow, non-powered lawn mower, fertilizer spreader, athletic field line marker, hand truck, etc.)

46t. (S)_____ Other portable non-powered equipment (write in _____
_____)

STATIONARY MACHINES AND EQUIPMENT

Machines and equipment which because of their size and/or nature of their use are not usually moved around, and which are used to do work on, process, apply energy to, or handle materials. Consider only those machines/equipment over which the worker has individual operating and/or monitoring responsibility; that is, do not consider large machine systems which must be operated by more than one worker. Classes of machine/equipment functions are listed below with specific examples of machines and equipment which are used in performing each function. Consider for each function whether or not the worker operates a machine or piece of equipment which performs that function. Then assign a rating on the significance of each machine/equipment function to the job.

Material Parting

47t. (S)_____ Cutting by sawing (circular table saw, radial arm saw, jig saw, power hacksaw, etc.)

48t. (S)_____ Cutting by abrasion (diamond wheel, etc.)

49t. (S)_____ Cutting by shearing (squaring shears, power paper cutter, power nibblers, etc.)

50t. (S)_____ Cutting by blade (meat slicer, paper slicer, etc.)

51t. (S)_____ Cutting by heat (arc cutter, etc.)

Material Joining

52t. (S)_____ Fusion (spot welder, plastic heat fusion machine, tire recapper, plastic microwave fusion machine, etc.)

53t. (S)_____ Bonding (rolling electronic wood welding machine, plastic welding machine, graphic arts bonding press, hydraulic steam wood press, vulcanizing machine, etc.)

54t. (S)_____ Stitching, knitting, and weaving (sewing machine, book binding machine, loom, knitting machine, etc.)

55t. (S)_____ Mechanical fastening (riveting machine, industrial stapler, etc.)

Surface Preparation

56t. (S)_____ Liquid application/coating (spray gun and gun cart, dipping vat, etc.)

57t (S)_____ Abrading (standing belt sander, surface grinder, tumble finishing machine, sand blasting machine, drum sander, honing machine, lapping machine, etc.)

Material Removal

58t. (S)_____ Drilling/perforating (drill press, laser beam machine, mortising machine, press punch, etc.)

59t. (S)_____ Shaping (threading machine, multi-spindle router, stationary wood planer, metal planer, wood shaper, metal shaper, lathe, milling machine, horizontal shaper, etc.)

60t. (S)_____ Grinding (tool grinder, surface grinder, etc.)

Forming

61t. (S)_____ Forming: extruding, rolling, molding, casting, bending, forging, etc. (casting machine, extrusion machine, die stamping machine, rolling machine, drop forge, pan brake, bending machine, etc.)

Heat Application, Except in Forming

62t. (S)_____ Heat application (oven, kiln, still, etc.)

Pressing, Except in Forming

63t. (S)_____ Pressing (steam press, wine press, pulp press, etc.)

Combining/Separating

64t. (S)_____ Combining/separating (paint mixer, commercial food mixer, pulp beater, clay mixer, on-site cement mixer, lab centrifuge, still, coin sorter, filter system, etc.)

Handling/Supporting

65t. (S)_____ Handling/supporting (vise, hydraulic lift, chain hoist, winch, etc.)

Other Stationary Machines and Equipment

66t. (S)_____ (Write in _____)

MECHANIZED EQUIPMENT

Equipment having wheels, tracks, cable systems, etc., which is powered, and is used to do work or to transport materials or people. Classes of mechanized equipment are listed below with specific examples of equipment of each type. Consider for each equipment type whether or not the worker operates equipment of that type. Then assign a rating on the significance of that equipment type to the job.

Mobile Work Equipment

67t. (S)_____ Heavy equipment (scraper, bulldozer, road grader, crane, asphalt paving machine, wheat combine, etc.)

68t. (S)_____ Medium/light equipment (farm tractor, wrecker, power line bucket truck, etc.)

Transportation Vehicles

69t. (S)_____ Large highway vehicles (tractor-trailer truck, bus, hook and ladder truck, etc.)

70t. (S)_____ Medium/light highway vehicles (car, pick-up truck, motorcycle, etc.)

71t. (S)_____ Off-road vehicles (jeep, snowmobile, all-terrain vehicle, powered golf cart, etc.)

72t. (S)_____ Rail vehicles (subway train, elevated train, freight/passenger train, street car, etc.)

73t. (S)_____ Air vehicles (helicopter, airplane, etc.)

74t. (S)_____ Water vehicles (motor boat, aquaplane, cabin cruiser, etc.)

Stationary Conveyor Systems

75t. (S)_____ Material conveyors (conveyor belt, freight elevator, etc.)

76t. (S)_____ People conveyors (ferris wheel, ski lift, passenger elevator, tramway, etc.)

SETTING/CONTROL DEVICES

Consider for each setting/control item below whether or not the worker uses a device of that type. Then assign a rating on the significance of that device type to the job.

SETTINGS: Devices (knobs, levers, cranks, etc.) which are positioned to determine the adjustment or form of operation of a machine or piece of equipment and which are seldom manipulated during machine operation.

Discrete Settings - having distinct, pre-determined positions

77t. (S)_____ Hand-operated (ignition switch, TV channel selector, railway switch control, on-off power switch, etc.)

78t. (S)_____ Foot-operated (foot-operated activation switch, etc.)

Continuous Settings - setting along a continuum

79t. (S)_____ Hand-operated (depth-of-cut setting on a brake drum turning machine, table saw blade height setting, radio volume setting, mixture valves on oxyacetelyne torch, etc.)

80t. (S)_____ Foot-operated (barber chair height setting, etc.)

CONTROLS: Devices (knobs, levers, pedals, wheels, etc.) which guide or regulate the operation of machines/equipment and which are frequently or continuously manipulated during operation.

Discrete Controls - controls which have distinct, pre-determined positions

81t. (S)_____ Hand-operated (tractor-trailer gear shift and axle speed changer, auto gear shift, etc.)

82t. (S)_____ Foot-operated (motorcycle gear shift, dictaphone playback switch, etc.)

Continuous Controls - controls without pre-determined positions

83t. (S)_____ Hand-operated (auto steering wheel, light aircraft joystick, etc.)

84t. (S)_____ Foot-operated (auto accelerator, light aircraft rudder controls, dentist's drill speed control, sewing machine speed control, auto brakes, etc.)

MEASUREMENT, LAYOUT, AND SCIENTIFIC DEVICES

Any devices which are used to measure properties of objects/materials, to lay out work, or for specialized professional or scientific purposes. Classes of device types are listed below with examples of specific devices of each type. Consider for each device type whether or not the worker uses a device of that type. Then assign a rating on the significance of each device type to the job.

Measurement

85t. (S)_____ Weight/volume (scales, graduated cylinders, measuring cups, rain gauges, etc.)

86t. (S)_____ Physical extent: Length, width, area, diameter, etc. (rules, micrometer, feeler gauge, surveyor's chain and transit, etc.)

87t. (S)_____ Electrical (ammeter, voltmeter, dwell meter, oscilloscope, potentiometer, instruments to measure conductivity, etc.)

88t. (S)_____ Pressure/temperature (thermometer, compression gauge, barometer, tire pressure gauge, pressure cooker gauge, etc.)

89t. (S)_____ Time (stopwatch, chronograph, punch clock, watchman's clock, scoreboard clock, etc.)

90t. (S)_____ Motion/force (instruments which measure torsion, force, tension, strain, speed, flow, rotation, etc.)

91t. (S)_____ Physical characteristics (instruments which measure density, acidity, hardness, specific gravity, elasticity, radioactivity, malleability, ductility, tensile strength, etc.)

Work Layout

92t. (S)_____ Work layout (level, chalkline, square, plumb bob, protractor, etc.) [Do not consider art and drawing instruments here.]

Professional and Scientific Devices

93t. (S)_____ Optical devices (lenses, prism, microscope, telescope, camera, spectrometer, etc.)

94t. (S)_____ Navigation/guidance/detection (radar, sonar, sextant, etc.)

Other Measurement or Layout Devices

95t. (S)_____ (Write in _____)

General Physical Requirements and Work Activities

This section of items deals with the physical capabilities and work activities required of the worker by his job. There are three categories of items:

General Physical Requirements

Work Activities Involving Materials, Objects, and Machines

Work Activities Involving Humans and Animals

GENERAL PHYSICAL REQUIREMENTS

Indicate the significance of each of the following physical activities or abilities in performing the job.

Coordination

1a. (S)_____ Eye-hand coordination: The ability to make rapid and accurate aiming movements with the hand in coordination with visual stimuli (operating a switchboard or multiple button control panel, positioning objects rapidly as in bricklaying, sorting mail into pigeonholes, etc.)

2a. (S)_____ Control precision: Making fine, highly controlled arm-hand or leg-foot movements in adjusting a control mechanism (operating a crane to position a steel beam for riveting, landing an airplane, etc.)

3a. (S)_____ Tracking: Intermittent or continuous adjustment to a moving target or a changing course. For example, maintaining a desired course of a vehicle or piece of equipment through space; guiding a piece of material through a machine; following a particular course with a tool through a piece of material, etc. based on visual, auditory, or tactual feedback (steering a car or flying an airplane, moving materials with a crane, cutting a pattern in a piece of wood with a jig saw, following a moving object through a telescope, etc.)

4a. (S)_____ Finger dexterity: Skillfully manipulating small objects with the fingers (cutting ornamental designs in jewelry, assembling clocks, wiring appliances, etc.)

5a. (S)_____ Manual dexterity: Making rapid skillful arm-hand movements in manipulating objects (changing spark plugs in a car; cutting, wrapping, and packing cheese in boxes; sewing pieces of material together using a sewing machine; etc.)

6a. (S)_____ Arm-hand steadiness: Arm-hand positioning of tools or objects where precision and steadiness are essential (manually welding two pieces of metal together, pouring acid into test tubes, lettering a sign on an office door, painting a picture, etc.)

7a. (S)_____ Reaction time: Responding quickly with an action in response to a "signal" (hitting the brakes in time to avoid a child who has run into your truck's path, responding to an aircraft engine warning light, stopping an electronic card sorter when a card jams, etc.)

8a. (S)_____ Multilimb coordination: Coordinating the movements of a number of limbs--both hands, both feet, or hands and feet--simultaneously (playing a piano, flying a light airplane, shifting the gears of a standard truck transmission, etc.)

9a. (S)_____ Balance: Maintaining body balance in situations where equilibrium is threatened or temporily lost (roofing a house with a hip roof, painting from a 12-foot ladder, serving meals on an airplane, walking a steel beam, etc.)

10a. (S)_____ General body coordination: Performing coordinated movements which involve the entire body (performing as a professional athlete, washing the windows of a skyscraper, demonstrating the use of a trampoline, policeman controlling rioters, etc.)

Movement

11a. (S)_____ Walking (making "rounds" with a doctor, patrolling a police beat on foot, etc.)

12a. (S)_____ Running (laying hose to fight a fire, operating a rescue service, etc.)

13a. (S)_____ Climbing (ascending a utility pole, painting the structural members of a bridge, etc.)

Positions

14a. (S)_____ Standing (barbering, cashiering, etc.)

15a. (S)_____ Sitting (typing a letter, driving a moving van, etc.)

16a. (S)_____ Kneeling/stooping/crawling (placing merchandise stock on lower shelves, changing a flat tire, inspecting under a house for termites, etc.)

17a. (S)_____ Lying (working under a car without the aid of a hoist, doing plumbing work in a low place, etc.)

Strength

18a. (S)_____ Finger/hand/arm strength: Exerting force against objects with the fingers, hands, or arms (cutting sheet metal with hand shears, loosening a rusty bolt, with hand wrenches, cutting metal rods with bolt cutters, etc.)

19a. (S)_____ General body strength: Exerting considerable force against objects for a brief period, as in lifting, pushing, pulling, carrying, etc. (stacking 100-lb. sacks of feed, moving furniture, etc.)

20a. (S)_____ Explosive strength: Expending a maximum of energy in one or a series of bursts (throwing a line from a ship to the shore; shoving a heavy appliance, such as a refrigerator, into place; etc.)

21a. (S)_____ Endurance/stamina: Exerting the body through continuous effort over a prolonged period of time (running cross-country, infantry man engaging in maneuvers, digging ditches, fighting a large forest fire, etc.)

22a. (S)_____ Dynamic strength: The ability to exert force repeatedly or continuously over time so as to move or support the body; requires muscular endurance and resistance to muscular fatigue (performing a dance routine; performing as a gymnast; riveting the sheet metal to an airplane wing, one rivet after another, repeatedly; etc.)

WORK ACTIVITIES INVOLVING MATERIALS, OBJECTS, AND MACHINES

This category of items contains a list of activities which characterize ways in which incumbents work with materials, objects, or machines. Consider for each item whether or not the incumbent performs the activity described. Then assign a rating on the significance of the activity to the job.

Machine-Related Activities

23a. (S)_____ Feeding/offbearing: Providing materials for and/or taking products from a processing machine (providing blank paper for a printing press or mimeograph machine, collecting knitted hosiery parts from automatic knitting machines, feeding and collecting punched data cards from a card reader, feeding metal stock into an automatic screw-making machine, etc.)

24a. (S)_____ Tending: Starting, stopping, making minor adjustments, and keeping watch over the performance of an automatic machine where minimal judgment is required (observing the operation of an automatic screw-making machine, tending an automatic meat slicer, sending cars through an automatic carwash, etc.)

25a. (S)_____ Operating/controlling: Setting up, starting, stopping, controlling, and adjusting the progress of machines or equipment, where some judgment is required (drilling holes using a drill press, making dresses using a sewing machine, setting up a milling machine, etc.)

26a. (S)_____ Driving/operating: Starting, stopping, and controlling the actions of machines or equipment for which a course must be steered (operating a car, bulldozer, wheat combine, crane, etc.)

Repair and Maintenance Activities

27a. (S)_____ Repairing: Restoring objects or machines to their intended, original state or shape (removing and replacing a burned-out picture tube in a TV set, taking the dent out of a car fender, etc.)

28a. (S)_____ Servicing: Performing routine maintenance on machines or equipment (cleaning and lubricating a typewriter, changing the oil in a car, etc.)

29a. (S)_____ Adjusting/tuning: Bringing some device or machine to optimum performance through proper setting of its adjustable components (adjusting a car's carburetor, aligning the wheels of a car, calibrating a short-wave radio tuning device, etc.)

30a. (S)_____ Diagnosing/troubleshooting: Determining the reason or reasons underlying the malfunctioning of machines or equipment (using a circuit tester to locate a bad component in an electronic system, locating the source of an automobile engine knock, locating a Freon leak in an air conditioning system, etc.)

Connecting/Attaching Activities

31a. (S)_____ Laying/covering: Placing sheets or pieces of materials over surfaces (laying carpeting, roofing, shingles, tile; hanging wallpaper; etc.)

32a. (S)_____ Installing/connecting: Placing and hooking-up components within larger systems (installing a new washing machine in a house, putting in an air conditioning system, installing a new fuel pump on an engine, installing a new muffler and tailpipe, etc.)

33a. (S)_____ Constructing/building: Producing structures by attaching structural members together or by casting materials (framing a house, riveting steel beams together, laying a brick wall, pouring concrete, etc.)

34a. (S)_____ Assembling: Taking pre-fabricated parts or pieces and putting them together to form a specified object (putting an ammeter together, assembling firearms, mounting tires on auto wheels, welding automobile gas tank halves together, etc.)

35a. (S)_____ Fiber/thread working: Stitching, sewing, weaving, tying, knitting, splicing, twining, etc. (seaming a drapery, re-weaving a hole in a fabric, sewing pieces of a man's suit together, repairing a fish net, etc.)

Material Modifying Activities

36a. (S)_____ Material shaping: Shaping materials by removing material segments through mechanical action, as in sawing, carving, cutting, grinding, milling, lathing, drilling, planing, etc. (cutting material according to a pattern for dressmaking, operating a wood lathe to make table legs, planing a door to fit a door frame, etc.)

37a. (S)_____ Material forming: Shaping materials through utilization of their plastic or molten properties or their reaction to pressure, as in casting, molding, rolling, extruding, forging, bending, modeling, etc. (folding sheet metal into ducting, casting ceramic vases, forging metal parts, etc.)

38a. (S)_____ Surface finishing: Working the surfaces of materials where the primary emphasis is on visual and/or tactile qualities and not the shape of the material (sanding a table top, varnishing a piece of furniture, polishing glass, painting a wall, etc.)

39a. (S)_____ Combining/separating: Intermixing/blending substances/materials or isolating/extracting one substance/material from others (mixing concrete; blending eggs, flour, etc.; producing alloys; stirring; centrifuging; filtering; distilling; floating; screening; ginning; evaporating; threshing; combing; etc.)

40a. (S)_____ Chemically treating: Modifying materials or substances through chemical reaction, as in oxidizing, neutralizing, preserving, dissolving, etc. (chemical milling, developing exposed film, dying or bleaching fabric, tanning hides, etching metal, etc.)

41a. (S)_____ Electrically treating: Modifying materials or substances through use of electrical current (electroplating, charging a battery, magnetizing metals, performing an electrolysis, etc.)

42a. (S)_____ Heat or pressure treating, except in forming: Heat or pressure treatment which does not utilize the plastic or molten properties of materials (incinerating, heat drying, steaming, curing tobacco, pressing shirts, cooking and baking, firing pottery, etc.)

Miscellaneous Object and Tool Handling Activities

43a. (S)_____ Cleaning: Removing unwanted particles from objects, materials, or places (washing dishes, sweeping the floor, steam cleaning an engine, laundering shirts, etc.)

44a. (S)_____ Material and object handling: Manipulating objects or materials as in sorting, arranging, wrapping, packing, loading, etc. (placing canned goods from boxes onto shelves, placing household goods into boxes for moving, loading a truckbed with crates, etc.)

45a. (S)_____ Earth working: Any activity concerned with digging, shoveling, or otherwise working the earth, minerals, stones, ores, etc. (digging holes for fence posts, spreading gravel for a driveway, stoking a coal furnace, etc.)

46a. (S)_____ Precision working: Working on materials with hand tools in a manner requiring close attention to detail and high levels of manual skill (repairing a watch, hand engraving an inscription, cutting a diamond, etc.)

Monitoring/Measuring/Inspecting Activities

47a. (S)_____ Monitoring: Attending to machine/equipment information displays to insure continued, desired operation (keeping watch over human physiological measures via TV screen in a hospital cardiac-care unit, operating the console of a computer, observing the control panel of a turbine electrical generating plant, etc.)

48a. (S)_____ Measuring/counting: Obtaining quantitative measures of objects or materials (counting the number of cars passing through an intersection, surveying a plot of land to determine its area, using a micrometer to measure the diameter of a metal shaft, etc.)

49a. (S)_____ Inspecting: Evaluating objects or materials by observation for compliance with some qualitative standards (inspecting a garment for symmetry, cut, seaming, etc.; inspecting a building for compliance with fire prevention codes; etc.)

50a. (S)_____ Testing: Checking or analyzing the properties of objects/materials or the performance of machines/equipment by systematically subjecting them to one or more tests (checking a storage battery for strength by using a voltmeter, checking the compression of the cylinders of an auto engine, performing a laboratory urinalysis, test driving a car or checking out a piece of equipment, etc.)

WORK ACTIVITIES INVOLVING HUMANS AND ANIMALS

The items which follow are concerned with activities which involve physical action upon people and/or animals. Consider whether or not the worker in the job you are rating performs each of the following activities. Then assign a rating on the significance on that activity to the job.

51a. (S)_____ Handling: Bodily handling of people or animals other than in treating or examining (walking a dog on a leash, searching a burglary suspect for weapons, controlling a violent prisoner or mental patient, transferring a hospital patient from a stretcher to a bed or surgical table, teaching a child to swim, etc.)

52a. (S)_____ Examining: Gathering diagnostic/prognostic information by using hands or hand tools/instruments (taking a patient's temperature, pulse, or blood pressure; manipulating an animal's leg to determine if broken; listening to a patient's breathing using a stethescope; etc.)

53a. (S)_____ Physical treatment, excluding surgery: Treating a person or animal by physical manipulation (rehabilitating, through physical therapy, a patient who had a broken back; relieving a muscle spasm with a chiropractic treatment; setting a broken bone; bandaging a wound; applying an ice pack; catheterizing a patient; massaging a person's body to stimulate blood circulation or relax stiff muscles; etc.)

54a. (S)_____ Surgical treatment: Treatment involving the cutting, scraping, etc. of tissue (performing a hemorrhoidectomy, cauterizing a growth, lancing an abscess, removing a gall bladder, inserting a pin in a broken hip bone, filling a tooth, etc.)

55a. (S)_____ Applying medicines: Treating a patient by applying or injecting medication (applying a lotion to a skin rash, administering eye drops, dusting a dog with flea powder, administering an injection, starting an intravenous solution, etc.)

Objects/Materials Acted Upon

The items in this section describe classes of objects and materials which might be acted upon by the incumbent. These are divided into five groups: Living Objects, Crude Materials, Processed Materials, Finished Parts and Components, and Finished Products. Objects/materials may be acted upon directly by hand or through the use of tools, machinery, equipment, chemicals, etc.

Workers act upon objects or materials in various ways. In some instances, the incumbent may take action which affects certain objects or materials but which requires little in the way of knowledge or understanding of those objects or materials, per se. For example: a dock worker loading machinery is not required to know the characteristics of the machinery; a refinery worker opening and closing valves which control liquid flow does not necessarily need to know the characteristics of the liquid; a truck driver transporting yard goods or a crane operator moving steel beams needs very little knowledge of the material being acted upon. In other instances, however, incumbents take action upon objects/materials which requires appreciable knowledge of the object or material characteristics. For example: a chemist mixing two substances to form a reaction, a machinist turning a high carbon steel part, a mechanic repairing an automobile engine, a pet shop operator trimming a poodle, etc.

In rating the Objects/Materials items which follow, consider for each item whether or not the incumbent takes action which affects the objects or materials described. Then assign a rating on the significance (to the job) of any action taken which affects the objects/materials in question. In cases where the incumbent acts upon the objects/materials in a way which requires negligible knowledge or understanding of those objects/materials, per se (as described in the preceding paragraph), the job should receive a low rating on those objects/materials, even though the incumbent may deal with them frequently.

Living Objects: This category contains living objects. Live plants may be cultivated, treated, and harvested. Live animals may be handled, groomed, sheared, milked, etc.; treated medically or surgically; and slaughtered for food. People may be handled, groomed, and treated medically and surgically.

1j. (S)_____ Plant life, including crops, trees, and shrubs (fields of of corn, peas, etc.; forests; nursery plants; flowers; etc.)

2j. (S)_____ Animals and marine life (pets, livestock, work animals, wildlife, fish, etc.)

3j. (S)_____ People (medical and dental patients, barber and beautician customers, physical therapy patients, combat casualties, etc.)

Crude Materials: This category contains materials in raw form, having been only minimally processed if at all. The kind of work done to crude materials is usually some kind of processing, such as refining, cleaning, treating with chemicals, mixing with other materials, cutting or crushing, etc.

4j. (S)_____ Terrain features (hills through which a highway must be cut, lowland which must be drained, fields to be plowed, etc.)

5j. (S)_____ Non-processed geological materials (mining and quarrying products, raw ores, crude fuels--coal and oil, rocks and stone, clay, sand, etc.)

6j. (S)_____ Non-processed woods (hardwood logs, pulp logs, fuel wood, etc.)

7j. (S)_____ Non-processed or minimally-processed animal materials (sides of beef; barrels of fish; skins, hides, and pelts; hooves, horns, bones; bulk milk and cheese; raw wool; etc.)

8j. (S)_____ Non-processed or minimally-processed plant materials, other than wood (bulk grain, carloads of vegetables, bales of cotton, hogsheads of tobacco, etc.)

Processed Materials: This category contains processed materials and objects. These are materials and objects in an intermediate stage which must undergo further modification or processing before becoming parts, components, or finished products.

9j. (S)_____ Metal, excluding precious metals (sheet metal; metal ingots, pigs, plates, rods, bars; uncut, unthreaded pipe; copper tubing; uncut metal beams; etc.)

10j. (S)_____ Lumber and related materials (lumber, plywood, roofing, siding, fiberboard, plasterboard, etc.)

11j. (S)_____ Earth materials (bricks, tiles, concrete, glass, cut stone, gravel, etc.)

12j. (S)_____ Rubber, plastic, and related synthetic aterials (sheet rubber, latex, plastics, etc.)

13j. (S)_____ Surface preparation and bonding substances (paints, lacquer, stains, glues, putty, resins, etc.)

14j. (S)_____ Chemical and petroleum materials and substances (acids, pharmaceuticals, asphalt, industrial chemicals, laboratory chemicals, etc.)

15j. (S)_____ Art and craft materials (artist's paints, sculpting media, decorative materials, precious metals, jewels, potter's clay, photographic materials, decorative leather, etc.)

16j. (S)_____ Textile and leather materials, including synthetics (bolts of cloth; silk; yarn; spools of nylon, dacron, etc.; upholstering material; canvas; leather; furs; etc.)

17j. (S)_____ Paper and paper materials (bulk paper, corregated and pressed paperboard, etc.)

18j. (S)_____ Medical materials (gauze, sutures, dental metals, dressings, medicated plasters, cast plasters, etc.)

19j. (S)_____ Processed foods, which require further preparation--mixing, cooking, baking, etc. (cuts of meats; fresh fruits and vegetables; staples--flour, oils, sugar, etc.; frozen, canned, and packaged foods; beverage mixes; etc.)

Finished Parts and Components: This category contains finished parts and components. The kinds of work which may be done to parts and components are installation into a larger system and assembly with other parts or components into finished products.

20j. (S)_____ Pre-fabricated construction components of metal and concrete (pre-cut steel beams and pipe, metal conduit and fixtures, metal partitions and staircases, pre-cast concrete units, railings, metal doors and window frames, fire escapes, etc.)

21j. (S)_____ Pre-fabricated construction components of wood and related materials (trusses, A-frames, millwork, wood fixtures, plastic and rubber moulding, etc.)

22j. (S)_____ Mechanical parts (crankshafts, gears, levers, wheels, bearings, valves, pistons, springs, etc.)

23j. (S)_____ Electrical and electronic parts and components (electric wires, resistors, capacitors, rheostats, transistors, diodes, switches, auto distributors, batteries, starter motors, ceramic bushings, etc.)

24j. (S)_____ Screws, non-electric wire, and wire products (bolts, nuts, screws, rivets, washers, nails, spikes, staples, fencing, screening, cable, etc.)

25j. (S)_____ Miscellaneous metal parts, excluding mechanical and electrical parts and construction components (toy parts, metal furniture parts, musical instrument parts, tool parts, precious metal parts, etc.)

26j. (S)_____ Miscellaneous wooden parts, excluding construction components (wooden furniture parts and frames, crate slats, wooden toy parts, parts for various wooden accessories and tools, etc.)

27j. (S)_____ Textile, leather, and related synthetic parts (apparel parts, saddle and harness parts, canvas tent sections, vinyl seat cover parts, etc.)

28j. (S)_____ Miscellaneous parts of materials other than metal, wood, or textiles--such as rubber, plastic, fiberglass, ceramics, etc. (ballpoint pen casings; tape dispenser parts; fiberglass product parts; plastic knobs, tubes, etc.; rubber hose parts; etc.)

Finished Products: This category contains finished products (objects and structures--such as machines, houses, electrical appliances, etc.). The kinds of work which may be done to finished products are installing, testing, adjusting, servicing, maintaining, repairing, and cleaning. In rating the objects in this category, do not rate an object greater than zero if the worker builds or assembles the object. In such cases, the worker is working on the object parts and not on the finished object; when the object is assembled and finished, the work is completed. Also, do not rate a machine, appliance, piece of equipment, or tool greater than zero if the worker merely operates or uses it. In such cases, the worker is working on the materials being processed rather than on the machine, appliance, equipment, or tool itself (unless he also maintains the machine or equipment, adjusts it, cleans it, etc.).

29j. (S)_____ Non-powered hand tools and work equipment (hammer, wrench, wheelbarrow, hand truck, ladder, etc.)

30j. (S)_____ Transportation and mechanized equipment (motor vehicles, cranes, bulldozers, railway cars, boats and ships, motorcycles, bicycles, airplanes, etc.)

31j. (S)_____ Machines and mechanical components, excluding transportation and mechanized equipment (card sorter, vending machine, drill press, chain saw, printing press, sewing machine, record changer, elevator, pump, hydraulic lift, etc.)

32j. (S)_____ Electrical/electronic equipment and components (TV set, electronic computer, electrical appliance, power transmission system, auto electrical system, house wiring, electrocardiagram machine, telephone switchboard, etc.)

33j. (S)_____ Professional, measurement, and scientific instruments (cameras and other optical equipment; measuring devices such as scales, micrometers, ammeters, etc.; watches and other precision instruments; drawing instruments; surgical and medical instruments; etc.)

34j. (S)_____ Equipment/systems, not elsewhere defined, excluding mechanical, electrical, professional, and scientific devices (gas oven, ductwork, coal furnaces, plumbing and sewage systems, etc.)

35j. (S)_____ Exteriors of large buildings (office buildings, hotels, apartment complexes, etc.)

36j. (S)_____ Exteriors of small buildings (houses, barns, small offices, etc.)

37j. (S)_____ Interiors of buildings (office buildings, hotels, apartment complexes, houses, small offices, etc.)

38j. (S)_____ Outdoor passageways and structures, other than buildings (bridges, towers, tunnels, dams, railways, streets and highways, airport runways, swimming pools, culverts, fences, piers, docks, etc.)

39j. (S)_____ Man-made land features (drainage ditches, landfills, terracing, road grades, etc.)

40j. (S)_____ Miscellaneous metal products, not elsewhere defined, excluding tools, machines, electrical equipment, structures, precious metal products, etc. (toys, metal furniture and shelving, musical instruments, file cabinets, stainless steel sinks, bathroom fixtures, metal containers, highway signs, etc.)

41j. (S)_____ Miscellaneous wooden products (furniture, wooden containers, decorative items, wooden kitchen utensils, picture frames, etc.)

42j. (S)_____ Rubber and plastic products (tires, bushings, plastic containers, etc.)

43j. (S)_____ Apparel and finished textile and leather products (clothes, household linens, drapes, carpet, upholstering, saddles and harnesses, luggage, etc.)

44j. (S)_____ Fabricated products of miscellaneous materials, not elsewhere defined (silverware, dishes, jewelry, ceramics, notions, wigs, etc.)

REPRESENTATIONAL WORK BEHAVIOR

THIS SUBCATEGORY OF ITEMS IS CONCERNED WITH SEMANTIC AND SYMBOLIC ACTIVITIES. IT IS DIVIDED INTO THE FOLLOWING CATEGORIES: REPRESENTATIONAL DEVICES, WRITTEN AND SPOKEN VERBAL COMMUNICATIONS, SYMBOLIC AND NUMERICAL COMMUNICATIONS, MISCELLANEOUS ASPECTS OF COMMUNICATION, AND DATA PROCESSING ACTIVITIES.

REPRESENTATIONAL DEVICES

Representational devices are used by the worker to present, display, or process information. For each device type below, consider whether or not the worker uses a device of that type. Then assign a rating on the significance of that device type to the job.

Visual

1r. (S)_____ Writing devices (blackboard and chalk; pen or pencil and paper; etc.)

2r. (S)_____ Drawing devices (drawing pencils, T-square, triangles, compass, dividers, etc.)

3r. (S)_____ Keyboard devices (typewriter, teletype, key punch, etc.)

4r. (S)_____ Still picture devices (overhead projector, opaque projector, slide projector, etc.)

5r. (S)_____ Visual signaling devices (signal lights, semaphore, etc.)

6r. (S)_____ Office reproducing devices (mimeograph, photocopy machine, microfilm printer, offset printer, spirit duplicator, etc.)

Audio and Audio-Visual

7r. (S)_____ Voice transmission and storage devices (telephone, two-way radio, public address system, intercom, dictaphone, mag tape recorder, etc.)

8r. (S)_____ Audio-visual transmission and storage devices (TV camera, video tape player, motion picture camera and projector, etc.)

Manual and Mechanical Data Processing Devices

9r. (S)_____ Hand computing devices (slide rules, nomographs, pilot's charts, numerical tables, etc.)

10r. (S)_____ Mechanical computing devices (desk calculator, adding machine, accounts posting machine, cash register, etc.)

11r. (S)_____ Data-card processing devices (card sorter, collator, verifier, card reproducer, etc.)

Electronic Computers

12r. (S)_____ Uses computer programs which were written by others and which are entered on the computer by others

13r. (S)_____ Writes computer programs for use by self or others and may or may not enter the programs on the computer

WRITTEN AND SPOKEN VERBAL COMMUNICATIONS

Consider the nature of the writing and speaking activities required of the worker. Then rate each activity described below using the scale indicated.

14r. (S)_____ Writing (fills out forms; writes notes, letters, reports, books; etc.)

15r. (*)_____ Writing: Level of difficulty (using the special scale below, indicate the highest level of writing activity required of the worker)

0 - Does not communicate by writing

1 - Very low (writes notes, takes down food orders, etc.)

2 - Low (fills out forms, etc.)

3 - Average (writes letters to clients or customers, etc.)

4 - High (writes feature articles in newspapers, etc.)

5 - Very high (writes textbooks, writes scholarly journal articles, etc.)

16r. (S)_____ Speaking: Conversing, lecturing, dictating, etc.

17r. (*)_____ Speaking: Level of skill or difficulty (using the special scale below, indicate the highest level of speaking skill required of the worker)

0 - Does not speak to others

1 - Very low (passes the word to others in one's work group, etc.)

2 - Low (orders supplies by phone, answers simple questions at department store information booth, etc.)

3 - Average (directs subordinates, discusses travel plans with others as a travel agent, etc.)

4 - High (interviews job applicants, communicates ideas to computer programmers, etc.)

5 - Very high (lectures classes, engages in public speaking, interprets diplomatic discourse from one language to another, etc.)

Consider the language or medium of communication, whether written or spoken, which is required of the worker. Then rate each medium below on the extent to which the worker communicates in that medium.

18r. (E)_____ Ordinary conversational English

19r. (E)_____ Formal, grammatically correct English (textbook editor, newscaster, etc.)

20r. (E)_____ Technical terms (electronics, chemistry, aerospace, etc.)

21r. (E)_____ Foreign language (German, Chinese, Vietnamese, Latin, etc.)

SYMBOLIC AND NUMERICAL COMMUNICATIONS

Consider whether or not the incumbent performs each of the activities described below. Then assign a rating on the significance of that activity to the job.

22r. (S)_____ Signals by visual means (hand signals, semaphore, lights, etc.)

23r. (S)_____ Communicates with special written codes (cryptograms, medical prescriptions, chemical formulas, shorthand, editing symbols, etc.)

24r. (S)_____ Communicates with auditory codes (Morse code, railway code, air traffic control "lingo," etc.)

25r. (S)_____ Communicates by drawing (architectural drawings, shop drawings, maps, schematics, wiring diagrams, etc.)

26r. (S)_____ Communicates with numbers (library call numbers, prices, times, velocities, etc.)

27r. (*)_____ Complexity of numerical information communicated: Indicate the level of complexity (or difficulty) of the incumbent's numerical communications.

0 - Communicates no numerical information

1 - Very low (telephone numbers, room or office numbers, license plate numbers, ages, etc.)

2 - Low (prices of grocery items, times, heights, lengths, etc.)

3 - Average (descriptive statistics, graphs, area by sq. ft., consumption rates, miles per gallon, etc.)

4 - High (probabilities, trig functions, acceleration in ft/sec^2, etc.)

5 - Very high (differential equations, irrational numbers, etc.)

MISCELLANEOUS ASPECTS OF COMMUNICATION

Below are some scales pertaining to several aspects of communication. Consider the usual communication activities required of the incumbent; then rate the job on the scale indicated.

28r. (*)_____ Communication ratio: In a speaking, writing, or signaling exchange with others, what is the overall ratio of the incumbent's communication activity to the communication activity of those with whom he interacts?

0 - Does not communicate with others

1 - 1% Worker/99% others (others do all the talking, writing, or signaling)

2 - 25%/75%

3 - 50%/50%

4 - 75%/25%

5 - 99%/1% (worker does all the talking, writing, or signaling)

29r. (*)_____ Communication precision: What level of precision in communication is required; that is, how important is it that the worker communicate without error?

0 - Does not communicate with others

1 - Very low (directing a highway road crew, parking lot attendant, etc.)

2 - Low (classroom discussion, ticket agent, sales clerk, etc.)

3 - Average (business correspondence, radio announcing, etc.)

4 - High (news reporting, court recorder, etc.)

5 - Very high (air traffic controller, physician ordering treatment, etc.)

30r. (*)_____ Personalness of subject matter: To what extent do the incumbent's communications deal with the personal matters of others?

0 - Does not communicate with others

1 - Subject matter is usually impersonal (ticket agent selling tickets from a ticket window, air traffic controller talking with pilots, telephone operator assisting in placing a call, etc.)

2 - Subject matter may have some personal content (barber or beautician talking with customer, door-to-door cosmetics salesperson talking with housewives, etc.)

3 - Subject matter may have a moderate amount of personal content (architect discussing house plans with a client, banker discussing a loan with a borrower, personnel manager interviewing job applicant, etc.)

4 - Subject matter is usually personal (lawyer discussing a case with a client, columnist responding to letters in a personal advice newspaper column, etc.)

5 - Subject matter is intimate, very personal (pastor counseling troubled parishioner, physician informing a patient of serious disease, etc.)

31r. (*)_____ Formality or structure of communicative interaction: On the average, to what extent is the form of the incumbent's communication prescribed or structured?

0 - Does not communicate with others

1 - Interaction is very loosely structured (brainstorming session, work or athletic team interaction, barber or beautician with customer, etc.)

2 - Interaction is informal, loosely prescribed (usual business office behavior, personal correspondence, sales clerk with customer, etc.)

3 - Interaction form is partially prescribed (lecturing a class, tour guide, business meeting, etc.)

4 - Interaction is formally prescribed (business letter, air traffic controller talking with pilots, lawyer arguing a case, etc.)

5 - Interaction form is rigidly prescribed (religious rituals, rites, and ceremonies; diplomatic proceedings, according to protocol; formal meetings, according to parliamentary procedure; etc.)

DATA PROCESSING ACTIVITIES

Consider whether or not the incumbent performs each of the data processing activities described below. Then assign a rating on the significance of that activity to the job.

32r. (S)_____ Comparing/checking: Judging whether or not some data representation complies with given standards (proofreading a mimeograph master before printing, checking a double-entry accounting ledger, checking a filing system for misplaced files, etc.)

33r. (S)_____ Copying/recording: Transcribing, entering, or posting data (operating a cash register, entering deposits and withdrawals in a savings account book, keeping books, typing from a rough copy, taking dictation, etc.)

34r. (S)_____ Classifying/categorizing: Organizing or grouping data in accordance with some system (sorting mail, filing "accounts receivable" and "accounts payable" in alphabetical order by firm or individual, etc.)

35r. (S)_____ Calculating/computing: Performing numerical operations

36r. (*)_____ Calculating/computing: Performing numerical operations. Use the special scale below to rate the highest level of difficulty of numerical operations required of the worker. The worker may use a computing device in performing the numerical operations, but should not be rated higher than the level of numerical understanding required of him by the job.

0 - Performs simple counting operations only or no numerical operations at all

1 - Adds, subtracts, multiplies, and divides whole numbers; adds and subtracts decimal numbers

2 - Adds, subtracts, multiplies, and divides fractions; multiplies and divides decimals; deals with equality relations

3 - Performs exponentiation, deals with inequality relations

4 - Performs logarithmic operations, trig functions

5 - Performs differentiation and integration, deals with difference equations

37r. (S)_____ Compiling: Collecting, organizing, and summarizing information for use by others (preparing a bibliography on a particular subject; preparing a book of recipes; organizing financial, enrollment, or other data into tables and charts; etc.)

38r. (*)_____ Analyzing: On the basis of careful examination and thought, breaking down, identifying, or separating the basic components or constituent parts of verbal or numerical information; also, determining the nature, significance, and relationships of these elements or parts to each other and to the overall structure or whole.

0 - None (packing eggs into cartons)

1 - Very low (identifying the basic instructions contained in an office memorandum)

2 - Low (identifying the subject, predicate, and preposition in a sentence)

3 - Moderate (identifying the basic points or facts in a table of insurance statistics)

4 - High (detecting logical fallacies in a political argument)

5 - Very high (breaking a job down into its component tasks based on oral and written descriptions of the work performed)

39r. (*)_____ Synthesizing: Combining and integrating verbal, numerical, and/or other symbolic information in order to produce new information such as plans, explanations, literary creations, theories, and other information; putting together information from different sources in order to form an original end-product. Thus, synthesizing involves varying degrees of originality or creativity; a rather high level of mental activity is implied. (Exampls of activities involving appreciable amounts of synthesizing might include: combining theories and findings in the literature on learning to produce a model of classroom instruction; designing a modification in a new engine based on laboratory reports of the engine's performance, company specifications, and concepts of engine design; combining information from current and past financial reports with economic theory to formulate a corporate investment plan; etc.) Use the special scale below to rate the job on the level of synthesizing required.

0 - None (installing a bumper on an automobile frame)

1 -.Low level (combining information on comparative prices and features of automobiles in preparing a sales pitch for customers)

2 - Low-moderate level (using news reports and other written material in preparing a speech to be delivered to a local men's club)

3 - Moderate level (using written specifications and drawings in designing a house)

4 - High level (combining information from written and oral reports with information from legal documents in formulating a plan of legal defense for a client)

5 - Very high level (revising a mathematical theory)

INTERPERSONAL WORK BEHAVIOR

THIS SUBCATEGORY OF ITEMS DEALS WITH THE TYPES OF CONTACTS WITH OTHER PEOPLE WHICH ARE REQUIRED OF THE WORKER IN PERFORMANCE OF THE JOB.

INTERPERSONAL ACTIVITIES

Items in this category deal with the types of interpersonal activities which are required by the job. For each item, consider whether or not the incumbent performs the activity described. Then rate that activity on its significance to the job.

Subordinate Activities

1p. (S)_____ Assisting: Providing assistance to a superior in performing a task (operating room nurse, dental assistant, welder's helper, airplane co-pilot, etc.)

2p. (S)_____ Serving/catering: Attending to the immediate needs and requests of others (waiter, hotel bellman, airline stewardess, store clerk, nurse, etc.)

3p. (*)_____ Directions received: Indicate which of the following best describes the type of directions received by the incumbent from his supervisor.

0 - Receives no directions; virtually independent (doctor in private practice, independent farmer, independent grocery store owner, etc.)

1 - Receives directions which specify general goals or objectives.

2 - Receives directions which specify general goals and general means of accomplishing these goals.

3 - Receives directions which specify goals (draftsman, computer programmer, etc.)

4 - Receives directions which specify specific goals and general means of accomplishing these goals.

5 - Receives directions which specify specific goals and specific means of accomplishing these goals (assembly line worker, construction worker, welder's helper, etc.)

4p. (*)_____ Surveillance received: Indicate which of the following best describes the extent to which the incumbent's performance is observed either directly or indirectly by his supervisor.

0 - None (independent physician, independent grocery store owner, etc.)

1 - Rarely (forest ranger, bus driver, etc.)

2 - Occasionally (airplane pilot, teacher, etc.)

3 - Frequently (salesman, welder, etc.)

4 - Very frequently (typist, draftsman, etc.)

5 - Continuously (operating room nurse, welder's helper, astronaut, etc.)

Supervisory Activities

5p. (S)_____ Close supervision: Frequently observes activities of subordinates, specifies specific work objectives, and specifies general or specific means of achieving these objectives (construction foreman, head waiter, office manager, etc.)

6p. (S)_____ General supervision: Infrequently observes activities of subordinates, specifies general work objectives, allows subordinate to determine means of accomplishing these objectives (research director, university dean, corporation executive, etc.)

7p. (S)_____ Evaluating: Judging individuals based on direct observation or reports of their performance (personnel recruiter, teacher, construction foreman, etc.)

8p. (S)_____ Personnel actions: Making decisions or recommendations concerning hiring, firing, transfer, promotion, placement, etc. (private businessman, shop manager, university dean, hospital administrator, department manager, etc.)

9p. (S)_____ Organizing: Arranging the work activities of subordinates in order to best accomplish the desired goals and to effectively utilize the human resources available (construction foreman, head waiter, corporate executive, clerical supervisor, etc.)

10p. (S)_____ Disciplining: Maintaining prescribed patterns of work behavior through punishment, coercion, or withholding of rewards (construction foreman, corporation executive, military officer, prison warden, etc.)

Communication Activities

11p. (S)_____ Giving information to others: Performs service for others by providing information in response to requests or questions (telephone information operator, receptionist, travel agent, agricultural extension agent, etc.)

12p. (S)_____ Obtaining information from others: Solicits information from others through interviewing and discussing (personnel recruiter, news reporter, police interrogator, lawyer, etc.)

13p. (S)_____ Demonstrating: Explaining and showing a product, procedure, or activity to convey information (salesman, instructor, home economist, farm machinery specialist, etc.)

14p. (S)_____ Persuading: Convincing others to change their beliefs, preferences, or opinions, or to take particular actions (politician, salesman, minister, lawyer, pitchman, etc.)

Professional Service Activities

15p. (S)_____ Teaching/instructing: Teaching subject matter or developing performance skills in others (high school teacher, industrial trainer, dance instructor, athletic coach, etc.)

16p. (S)_____ Advising/counseling: Dealing with others to assist them in solving personal, organizational, financial, legal, or other problems (school counselor, minister, management consultant, investment counselor, lawyer, etc.)

17p. (S)_____ Treating: Application of first-aid, medical, or surgical procedures to individuals (doctor, nurse, physical therapist, psychiatrist, etc.)

Conflict Resolution

18p. (S)_____ Arbitrating: Settling conflict between opposing parties as an outside party by imposing a settlement based on consideration of the issues involved (domestic relations judge, labor arbitrator, baseball umpire, etc.)

19p. (S)_____ Negotiating: Settling conflict through discussion and bargaining with the opposing party (labor union representative, buyer, management labor relations executive, attorney representing plaintiff in out-of-court settlement, etc.)

20p. (S)_____ Debating/discussing: Verbal interaction between two or more participants where various arguments are presented and evaluated in a reasoned or logical manner (committee member, legislator, lawyer, member of executive staff, etc.)

21p. (S)_____ Pacifying/placating: Handling grievances and complaints through conciliation, discussion, explanation, or action (landlord, department store clerk handling complaints, policeman, etc.)

22p. (S)_____ Mediating: Settling conflict between two parties as an outside party by promoting settlement or reconciliation through compromise or accommodation (marriage counselor, labor mediator, school counselor handling disputes between students, etc.)

Entertaining/Socializing

23p. (S)_____ Diverting/entertaining: Acting or arranging activities in order to amuse or give pleasure to others (master of ceremonies, night club comedian, tour guide, camp counselor, social director, etc.)

24p. (S)_____ Socializing: Participation in social functions or events as part of one's job responsibility (public relations man, diplomat, business executive, salesman, etc.)

PERSON TYPES

Items in this category deal with the types of people with whom the incumbent interacts. Consider for each item whether or not the incumbent comes into personal contact with the people described. Then assign a rating on the significance of that interpersonal contact to the job.

25p. (S)_____ Superiors: Those who exercise control or authority over the incumbent (supervisor, foreman, etc.)

26p. (S)_____ Peers: Those with status about equal to the incumbent's (co-workers, etc.)

27p. (S)_____ Subordinates: Those over whom the incumbent exercises authority or control (employees, etc.)

28p. (S)_____ Clients or patients: Those who seek out services of the incumbent and over whom the incumbent has influence but not legitimate power (doctor's patients, lawyer's clients, etc.)

29p. (S)_____ Consultants or advisors: Those who provide information or advice to the incumbent (staff members, subject matter specialists, technical experts, etc.)

30p. (S)_____ Customers: Those who purchase goods or services from the incumbent

31p. (S)_____ General public: Those whom the incumbent encounters in transient unstructured relationships which are unlikely to reoccur (people inquiring at an information booth, visitors to a national park, etc.)

32p. (S)_____ Students: Those whom the incumbent teaches or instructs

33p. (S)_____ Children: Persons 11 years of age and under

34p. (S)_____ Adolescents: Persons from ages 12 to 17

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D. WORK GOALS

THIS CATEGORY OF ITEMS DEALS WITH WORK GOALS, OR OBJECTIVES. WORK OBJECTIVES ARE CONDITIONS WHICH THE WORKER IS FULLY OR PARTLY RESPONSIBLE FOR BRINGING ABOUT OR MAINTAINING, EITHER THROUGH HIS OWN WORK BEHAVIOR OR THROUGH DIRECT (ON-THE-SCENE) SUPERVISION OF THE WORK BEHAVIOR OF OTHERS. THUS, WORK OBJECTIVES (OR GOALS) CAN BE THOUGHT OF AS THE PRESCRIBED OUTCOMES OF THE INCUMBENT'S WORK—THINGS WHICH ARE SUPPOSED TO BE ACCOMPLISHED IN A JOB.

THE WORK-OBJECTIVE ITEMS ARE DIVIDED INTO THE FOLLOWING NINE GROUPS:

MECHANICAL OBJECTIVES

ELECTRICAL OBJECTIVES

OBJECTIVES ACCOMPLISHED THROUGH MATERIAL/OBJECT ARRANGEMENT OR MODIFICATION

ENVIRONMENTAL/EARTH OBJECTIVES

ART/DECORATIVE OBJECTIVES

BIOLOGICAL/HEALTH OBJECTIVES

SEMANTIC/SYMBOLIC OBJECTIVES

BUSINESS/ORGANIZATIONAL OBJECTIVES

OBJECTIVES RELATED TO PEOPLE AND ANIMALS

MECHANICAL OBJECTIVES

Consider whether or not the incumbent accomplishes or contributes directly to the accomplishment of each of the mechanical objectives described below. Then assign a rating on the significance of that objective to the job.

1g. (S)_____ Substandard conditions of mechanical devices detected (device scratched, device fails to meet specifications, loose connections, device improperly assembled, etc.)

2g. (S)_____ Causes of mechanical malfunction located or identified (clogged fuel line discovered, defective part found, broken gear tooth located, source of leak discovered, improperly adjusted part discovered, etc.)

3g. (S)_____ Mechanical functioning maintained (parts or fittings greased, connections tightened, oil changed, filter replaced, device cleaned, belt tightened, etc.)

4g. (S)_____ Proper mechanical functioning restored (defective parts replaced or repaired, leak stopped, idle speed adjustment made, fluid line unstopped, etc.)

5g. (S)_____ Mechanical devices installed or assembled (knitting machine installed, air conditioner installed, washing machine installed, bicycle assembled, water pump assembled, etc.)

6g. (S)_____ Satisfactory output from mechanical devices (sufficient water pressure maintained by a pump, parts fabricated which meet specifications, desired temperature maintained by heating system, sufficient rate of output from a printing machine maintained, etc.)

7g. (S)_____ Properly regulated or controlled mechanical devices (properly driven truck, properly regulated machines, smooth landing of an airplane, properly regulated gas pressure, etc.)

8g. (S)_____ People, objects, or materials transported (bus passengers transported, household goods delivered, people safely transported on a ski lift, material delivered to construction site, etc.)

9g. (S)_____ Mechanical drawings (machine drawings, machine layout drawings, machine design sketches, automobile design drawings, etc.)

10g. (S)_____ Mechanical plans or innovations (machine design completed, plans for machine alteration made, schedule for maintenance accomplished, new aerodynamic principle outlined, etc.)

11g. (S)_____ Written communication of mechanical information (machine operating instructions written, completed patent application for new machine, machine maintenance guidelines written, report of aircraft test flight completed, laboratory report on test of engine prototype written, etc.)

ELECTRICAL OBJECTIVES

Consider whether or not the incumbent accomplishes or contributes directly to the accomplishment of each of the electrical/electronic objectives described below. Then assign a rating on the significance of that objective to the job.

12g. (S)_____ Substandard conditions of electrical/electronic devices detected (device scratched, device fails to meet specifications, insulation cracked, connections loose, device improperly assembled, etc.)

13g. (S)_____ Causes of electrical/electronic malfunction located or identified (defective tube found, disconnected wire discovered, short circuit located, burned fuse discovered, burned out capacitor located, etc.)

14g. (S)_____ Electrical/electronic functioning maintained (device cleaned, connections tightened, corrosion prevented, device lubricated, etc.)

15g. (S)_____ Electrical/electronic functioning restored (tube replaced, circuit rewired, switch replaced, motor brushes replaced, connection soldered, transformer repaired, etc.)

16g. (S)_____ Electrical/electronic devices installed or assembled (wiring in a house installed, power lines and transformers installed, antenna installed, TV picture tube installed, amplifier assembled, electric motor assembled, microwave relay installed, etc.)

17g. (S)_____ Electrical/electronic devices regulated, adjusted, or controlled (flow of electrical power regulated, volume or frequency controls adjusted, transformer controls adjusted, receiver sensitivity adjusted, transmitter output controlled or adjusted, controls on electronic test equipment adjusted, etc.)

18g. (S)_____ Satisfactory output from electrical/electronic devices (TV picture has desired linearity, electrical saw has sufficient cutting speed, generator produces sufficient voltage, sufficient heat from electrical heater, proper channel separation from stereo record player, etc.)

19g. (S)_____ Electrical/electronic schematics and/or diagrams (house wiring diagram completed, electronic schematic completed, design drawing for prototype electrical device completed, etc.)

20g. (S)_____ Electrical/electronic innovations or plans (electrical patent application completed, plans for improved efficiency in use of generating facilities, survey of community's power needs completed, innovation made in amplification of microwave energy, etc.)

21g. (S)_____ Written communication of electrical/electronic information (written description of an electrical circuit, patent application for new electronic device completed, description of new design completed, installation instructions for electrical device written, etc.)

OBJECTIVES ACCOMPLISHED THROUGH MATERIAL/OBJECT ARRANGEMENT OR MODIFICATION

Consider whether or not the incumbent accomplishes or contributes directly to the accomplishment of the objectives defined below. Then assign a rating on the significance of that objective to the job.

Connecting/Attaching Objectives

22g. (S)_____ Completed structures and other constructed objects: Structures or parts of structures and other constructed objects formed by various interconnected materials, usually on a non-standardized basis (houses, buildings, bridges, custom-made cabinets, ships and custom-made boats, power line towers, etc.)

23g. (S)_____ Assembled or fabricated objects: Objects made to standardized specifications from various interconnected parts or materials; such objects are usually produced in factories and are often interchangeable with other objects made to the same specifications (firearms, cameras, engines, millwork such as window and door frames, furniture, electronic equipment, textiles, apparel, rope, wooden containers, etc.)

24g. (S)_____ Installed or attached objects: Objects/materials which are installed or attached to larger units (installed plumbing, installed tile, attached wallpaper, installed upholstery, installed muffler and tail pipe, etc.)

Material Modification Objectives

25g. (S)_____ Shaped objects: Objects/materials modified by material-removing action (such as chipping, shearing, drilling, grinding, sawing, cutting, pipe threading, filing, carving, milling, planing, tumbling, routing, etc.)

26g. (S)_____ Formed objects: Objects/materials which have been shaped through utilization of their plastic or molten properties (objects which have been cast, molded, rolled, extruded, forged, bent, etc.)

27g. (S)_____ Finished or prepared surfaces (painted surfaces, sanded surfaces, waxed/polished surfaces, caulked seams, putty-filled surface pits and holes, etc.)

28g. (S)_____ Materials/substances modified by miscellaneous mechanical actions, excluding material removal and forming (for example, modifications accomplished by mixing, beating, centrifuging, threshing, ginning, combing, washing, etc.)

29g. (S)_____ Treated materials or substances: Materials/substances modified by chemical action, heat, electricity, pressure, or radiation (such modification might be brought about by tanning, bleaching, fermenting, plating, electrolysis, charging, irradiation, drying, firing, baking, smelting, tempering, waterproofing, dyeing, etc.)

Preventive/Corrective Objectives: Such conditions can be met through inspection, analysis, testing, maintenance, repair, and other preventive or corrective measures.

30g. (S)_____ Satisfactory condition of structures and other constructed objects (houses, buildings, bridges, ships and boats, cabinets, etc.)

31g. (S)_____ Satisfactory condition of assembled or fabricated objects, excluding mechanical and electrical/electronic devices (firearms, cameras, furniture, apparel, textile materials and products, wooden containers, etc.)

32g. (S)_____ Satisfactory condition or state of modified objects, materials, or substances, including formed, shaped, and treated materials and finished surfaces (pharmaceuticals; machine gears; synthetic materials or products; metal pigs, sheets, rods, beams, pipes; furniture parts; glassware; petroleum products; etc.)

Object-Arrangement Objectives

33g. (S)_____ Spatially arranged objects (properly arranged shrubs, furniture or other merchandise arranged in a show window, equipment arranged within a work space, etc.)

34g. (S)_____ Properly located or placed objects (shelved goods, boxed items, stacked lumber, etc.)

Innovation and Communication Objectives Concerning Objects/Materials

35g. (S)_____ Innovations or plans in construction, installation, or spatial arrangement of objects (house designs, ship designs, bridge designs, plans for construction operations, plans for installation of a power generator, plans for physical layout in a factory, plans for a window display, etc.)

36g. (S)_____ Innovations or plans in assembly, fabrication, or material modification (plans for assembly operation; design for a fabricated product; plans for material modification operations, such as forming, shaping, coating, or treating; research discovery concerning material properties; introduction of a new material processing technique; etc.)

37g. (S)_____ Written communications pertaining to construction, installation, or spatial arrangement (building codes written, installation instructions written, specifications for building written, technical article concerning new construction process written, description of landscape arrangement written, etc.)

38g. (S)_____ Written communications pertaining to material/object modification, assembly, or fabrication (procedures for materials processing written, manufacturing specifications written, laboratory analysis report written, magazine article concerning new fabrication process written, etc.)

39g. (S)_____ Drawings or diagrams of constructed, assembled, modified, fabricated, or arranged objects/materials (house plans completed, working drawings completed, equipment design drawings completed, plant layout drawings completed, landscape diagram drawn, etc.)

ENVIRONMENTAL/EARTH OBJECTIVES

Consider whether or not the incumbent accomplishes or contributes directly to the accomplishment of each of the environment/earth objectives described below. Then assign a rating on the significance of that objective to the job.

Plant Life

40g. (S)_____ Soil prepared and/or plants, shrubs, or trees planted (soil plowed, fertilizer applied, crops planted, seedlings planted, ground watered, grass planted, etc.)

41g. (S)_____ Plant life maintained (lawn mowed, hedges trimmed, plants and trees sprayed, plant disease detected and treated, etc.)

42g. (S)_____ Plant products harvested or extracted (crops harvested, wheat combined, timber cut, sap extracted, fruit picked, etc.)

43g. (S)_____ Innovations or plans related to plant life (new breed of plant developed, new method of plant treatment developed, conservation plan for forest developed, plot plan for planting flowers determined, etc.)

44g. (S)_____ Written communications concerning plant life (plant type described, plant disease described, planting procedure described, report of timber survey written, etc.)

Terrain/Earth Features

45g. (S)_____ Raw geological materials extracted (coal extracted, petroleum extracted, iron ore mined, sand loaded, soil samples extracted, etc.)

46g. (S)_____ Terrain or earth features modified (ditches dug, basements dug, rocks blasted, embankments bulldozed, earth dam built, harbors dredged, etc.)

47g. (S)_____ Satisfactory condition of earth/terrain features maintained (erosion prevented, channels cleared, drainage ditches maintained, nature trail maintained, etc.)

48g. (S)_____ Innovations or plans concerning terrain/earth features (mining plans developed, new mining procedures developed, plans for excavation determined, plan for combating erosion developed, etc.)

49g. (S)_____ Written communications concerning terrain/earth features (publication on soil erosion prepared, instructions for oil drilling written, terrain feature described, report on rock formations completed, etc.)

Water, Atmosphere, and Space

50g. (S)_____ Maintenance of satisfactory water conditions and/or detection of unsatisfactory water conditions (pollution control procedures followed, water level maintained, floods prevented, water pollutants detected, etc.)

51g. (S)_____ Atmospheric conditions monitored or forecasted (weather phenomena predicted, meteorological data collected, air samples tested for pollution, etc.)

52g. (S)_____ Astronomical events predicted, observed, or recorded (eclipse photographed, position of stars observed and noted for navigational purposes, information about planets or satellites collected, movement of space vehicle monitored, etc.)

53g. (S)_____ Innovations or plans concerning water, atmospheric, or astronomical conditions or events (water pollution control plans made, air pollution detection measures developed, improved weather prediction methods developed, new star detected, etc.)

54g. (S)_____ Written communications pertaining to water, atmospheric, or astronomical conditions or events (water condition described, weather report written, emergency weather advisory written, report on sun flares completed, etc.)

Other Environmental Objectives

55g. (S)_____ Environmental charts, diagrams, or maps produced (meteorological charts produced, terrain maps produced, solar system charts prepared, etc.)

56g. (S)_____ Environmental emergencies detected, prepared for, or dealt with (forest fires detected, hurricane preparations made, forest fires brought under control, snow removal accomplished, etc.)

ART/DECORATIVE OBJECTIVES

Consider whether or not the incumbent accomplishes or contributes directly to the accomplishment of each of the objectives defined below. Then assign a rating on the significance of that objective to the job.

57g. (S)_____ Aesthetically arranged objects or things (landscaped mall, decorated room, arranged or positioned furniture, completed window display, etc.)

58g. (S)_____ Original art objects (sculpture, painting, jewelry, wood carving, etc.)

59g. (S)_____ Successfully completed performance (ballet performance, play or theatrical performance, night club act, concert, etc.)

60g. (S)_____ Innovations in performing arts (new screenplay written, musical innovations made by composer, innovations by director in staging a drama, etc.)

61g. (S)_____ Completed art/decorative plans or designs (completed interior design plan, completed stage layout plan, completed working model, completed preliminary sketch for painting, completed choreography plan, etc.)

62g. (S)_____ Art/decorative information communicated (art lecture given, art student instructed, description of an art objective written, review of art show written, article written on the interior design scheme of a model home, review of a play written, etc.)

BIOLOGICAL/HEALTH OBJECTIVES

Consider whether or not the incumbent accomplishes or contributes directly to the accomplishment of each of the objectives defined below. Then assign a rating on the significance of that objective to the job.

63g. (S)_____ Causes or potential causes of health problems identified (virus isolated, hormone imbalance detected, inflamed appendix discovered, abnormal blood count detected, tumor discovered, tooth decay detected, etc.)

64g. (S)_____ Health problems relieved or eliminated (tumor removed, broken arm set and placed in a cast, physical therapy administered, drugs administered, tooth filled, etc.)

65g. (S)_____ Potential health problems prevented or mitigated (patient innoculated, exercises prescribed, diet prescribed, information concerning dental hygiene practices given, etc.)

66g. (S)_____ Medically related service tasks completed (patient bathed, bed sheets changed, patient fed, bed pan emptied, etc.)

67g. (S)_____ Biological/health inspections performed (kitchen inspected for sanitation, swimming pool inspected for cleanliness, buildings inspected for adherence to health standards, hospital inspected for adherence to health standards, etc.)

68g. (S)_____ Biological/health tests performed (tests on animals to determine pollution effects, urinalysis performed, blood tests made, liver biopsy performed, food analyzed for nutritional value, water tested for bacteriological count, etc.)

69g. (S)_____ Biological/health measurements taken (brain wave recording completed, blood pressure taken, electrocardiogram completed, measures of developing embryos taken, body temperature recorded, etc.)

70g. (S)_____ Written biological/health communication completed (lab reports completed, patient history recorded, patient treatment records completed, biological research reports written, reports of tissue studies written, birth control pamphlet written, report on the circadian rhythm in Rhesus monkeys written, etc.)

71g. (S)_____ Biological/health innovations or plans (new vaccine developed, plans for innoculation program completed, innovations in dispensing health services made, research completed concerning effects of industrial wastes on animal life, etc.)

SEMANTIC/SYMBOLIC OBJECTIVES

Consider whether or not the incumbent accomplishes each of the objectives defined below. Then assign a rating on the significance of that objective to the job.

Verbal Objectives

72g. (S)_____ Routine written output (routine correspondence, application blanks, receipts, restaurant checks, customer orders, etc.)

73g. (S)_____ Non-standard or innovative written output (technical reports, non-routine correspondence, books, newspaper articles, poetry, etc.)

74g. (S)_____ Written material reviewed or edited for content (manuscript checked for factual accuracy, technical report reviewed for publication, book edited for adherence to ethical standards, speech text reviewed for newsworthiness, etc.)

75g. (S)_____ Written material edited or checked for composition and format (manuscript edited for grammar, letter checked for punctuation and spelling, report checked for format, report edited for organization and clarity of expression, etc.)

76g. (S)_____ Written material categorized (correspondence filed, mail sorted, books categorized, reports indexed, etc.)

77g. (S)_____ Oral information communicated (speeches completed, workers informed, negotiations completed, radio transmission completed, dictation completed, etc.)

78g. (S)_____ Verbal material transcribed (dictation transcribed, manuscript typed, message copied, court proceedings recorded, etc.)

Numerical Objectives

79g. (S)_____ Solutions to standard arithmetic problems (total price calculated, recipe conversions made, required amount of materials for a job determined, daily sales totals calculated, etc.)

80g. (S)_____ Solutions to advanced mathematical problems--problems requiring more than basic arithmetic (algebraic equations solved, distance between two points determined through application of trigonometry, stress on a beam computed, calculus problem solved, etc.)

81g. (S)_____ Recorded or transcribed numerical data (cash receipts posted, inventory count posted, list of phone numbers transcribed, employee time records transcribed, expenditures posted in ledger, numbers entered on keyboard device, etc.)

82g. (S)_____ Numerical data displayed (balance sheet prepared, census data displayed in tables, stock prices graphed, project earnings chart prepared, airline schedules posted, etc.)

83g. (S)_____ Numerical information orally communicated (prices quoted; telephone numbers given; arrival time estimates and altitude reported by pilot; wind velocity, barometric pressure, and temperature reported by meteorologist; etc.)

Pictorial and Other Symbolic Objectives

84g. (S)_____ Completed diagrams, charts, and maps (flow charts, machine drawings, house plans, road maps, layout drawings, etc.)

85g. (S)_____ Information encoded into written symbols or codes (computer program written, shorthand message taken, editorial corrections written on a manuscript, message encoded into cryptogram, etc.)

86g. (S)_____ Information transmitted by non-written codes and signals (Morse code message transmitted, message sent through semaphore, message transmitted to a deaf person using hand language, orchestra directed, etc.)

87g. (S)_____ Reproduced semantic/symbolic material (manuscript photocopied, offset copies printed, stencil copies made, microfiche copy made, etc.)

88g. (S)_____ Semantic/symbolic material verified (copy compared with original, list of names checked for omissions, list of numbers checked for accuracy, cash receipts compared with cash register tape, shelving of library books checked, computer data cards checked against printout sheet, etc.)

BUSINESS/ORGANIZATIONAL OBJECTIVES

Consider whether or not the incumbent accomplishes or contributes directly to the accomplishment of each of the objectives defined below. Then assign a rating on the significance of that objective to the job.

89g. (S)_____ Completed sales or business/organizational transactions (payment received, contracts signed, deeds transferred, etc.)

90g. (S)_____ Merchandise shelved, packaged, stored, demonstrated, or otherwise handled (grocery store shelves stocked, inventory stock counted, customer's orders filled, vacuum cleaner demonstrated, etc.)

91g. (S)_____ Advertising material produced, displayed, or disseminated (window displays completed, advertising brochures prepared, advertising copy received, radio advertisement presented, newspaper advertisement designed, etc.)

92g. (S)_____ Employee relations accomplishments (indications of high employee morale, human relations program introduced, grievances settled, incentive pay scale established, employee insurance program introduced, labor negotiations completed, etc.)

93g. (S)_____ Public relations accomplishments (favorable comments or letters received, return customers, favorable recommendation received from customer or client, favorable news articles concerning the organization, public relations project completed, etc.)

94g. (S)_____ Balanced, verified, or updated business/organizational records (ledger entries posted, balanced, or verified; agreement between checks and bank statement; agreement between cash on hand and records of cash receipts; accounting records audited; agreement between inventory records and stock on hand; etc.)

95g. (S)_____ Satisfactory index of organizational performance attained (satisfactory company growth rate attained, satisfactory profit margin, reduced employee turnover rate, department sales quota met, plant production quota met, etc.)

96g. (S)_____ Business/organizational data gathered, compiled, or displayed (chart of university enrollment prepared, business sales data compiled, graph of projected earnings prepared, graph of accounts receivable prepared, hospital patient load determined, etc.)

97g. (S)_____ Organizational plans or innovations (profit goals set, merger plans made, expansion plans made, new inventory system devised, new promotion policy implemented, marketing plans devised, new work incentive plan devised, etc.)

98g. (S)_____ Contracts and other legal documents drawn up (contract written, will drawn up, lease agreement written, patent application completed, property deed written, etc.)

99g. (S)_____ Written business/organizational communication (advertising materials written, annual reports written, written business correspondence, etc.)

OBJECTIVES RELATED TO PEOPLE AND ANIMALS

Consider whether or not the incumbent accomplishes or contributes directly to the accomplishment of each of the objectives defined below. Then assign a rating on the significance of each objective to the job.

People

100g. (S)_____ Improved state of grooming or appearance of people (manicured fingernails, fashionably styled hair, fitted clothing, improved posture, properly coordinated attire, etc.)

101g. (S)_____ Physical competence of others improved or assessed (aircraft successfully landed by student pilot, dive properly executed by student diver, material correctly typed by student typist, car properly parked by driving license applicant, tractor-trailer properly backed by student driver, earth moving operation properly performed by heavy equipment trainee, etc.)

102g. (S)_____ Others' knowledge improved or assessed (student behavior indicating mastery of instructional material, increased facility of a sales trainee in discussing his product, responses by job applicant indicating satisfactory level of work experience, satisfactory score on a college entrance test, etc.)

103g. (S)_____ Attitude, opinion, or belief change in others (change in a customer's product preference, changed opinion of a constituency toward a political candidate, change in a foreman's racial attitudes, changed attitudes of students toward learning, etc.)

104g. (S)_____ Others' compliance with directions, rules, or laws insured or monitored (construction crew working as directed, motorists obeying traffic laws, basketball players playing by the rules, appropriate territory covered by a salesman, conformity by students to rules of conduct, orchestra performing as desired, etc.)

105g. (S)_____ Improved adjustment or adaptation of others (student advisee successfully employed, client's demonstrated ability to manage his financial resources, parole period ended without violation, handicapped client showing progress toward rehabilitation, etc.)

106g. (S)_____ Financial or legal position of others improved or maintained (favorable court settlement obtained for client, value of client's investment portfolio increased, client advised concerning legal rights, income tax return prepared for client, recommendations made to customer pertaining to individual insurance program, etc.)

107g. (S)_____ Enjoyment, satisfaction, or mood change of others (desired audience reaction, customers' or clients' expression of satisfaction with services rendered, indications of worker satisfaction or good morale, morale of football team improved, kindergarten class entertained, etc.)

108g. (S)_____ Innovations or plans pertaining to people (new teaching method implemented, innovative counseling program devised, attitude surveys designed, market research program developed, research findings on intra-organizational communication implemented, self-improvement education program for employees implemented, etc.)

109g. (S)_____ Written communication pertaining to people (completed psychological evaluation, completed article on migration trends, completed employment recommendation, completed report of police investigation, completed research report concerning group behavior, etc.)

Animals

110g. (S)_____ Improved state of grooming or appearance of animals (hair or fur trimmed, hair or fur curried or groomed, animal bathed or cleaned, nails trimmed, etc.)

111g. (S)_____ Performance of animals improved, assessed, or controlled (improved jumping ability of a horse, training of a seeing eye dog completed, dog trained to retrieve birds, animal obedience improved, horse race winner determined, field trials judged, pace of race horse controlled by jockey, etc.)

112g. (S)_____ Written communications pertaining to animals (article concerning animal training or handling written, guidelines for animal grooming written, report on social behavior of chimpanzees written, etc.)

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E. WORK CONTEXT

THIS CATEGORY OF ITEMS DEALS WITH VARIOUS ASPECTS OF THE WORK SITUATION OR ENVIRONMENT. IT IS DIVIDED INTO FIVE GROUPS: PHYSICAL CONTEXT, JOB STRUCTURE, MISCELLANEOUS CONDITIONS AND REQUIREMENTS, SOCIAL CONTEXT, AND INCENTIVES.

PHYSICAL CONTEXT

The following items deal with various aspects of the physical environment within which the incumbent works. Consider for each item whether or not the condition described is a part of the job. Then rate that condition on the indicated scale.

Work Location

1c. (*)_____ Indicate the amount of time the worker spends inside and outside. The worker is considered inside if he is protected from weather conditions but not necessarily from temperature changes.

0 - Always inside (secretary, pharmacist, barber, etc.)

1 - 80% inside/20% outside (insurance salesman, railroad conductor, electrician, etc.)

2 - 60% inside/40% outside (carpenter, house painter, county agricultural agent, etc.)

3 - 40% inside/60% outside (forest ranger, highway engineer, nurseryman, etc.)

4 - 20% inside/80% outside (grain farmer, brickmason, mail carrier, construction worker, etc.)

5 - Always outside (roofer, power lineman, heavy equipment operator, etc.)

Unpleasant Physical Conditions: Below is a list of unpleasant conditions. Indicate the extent to which the worker is exposed to each condition.

2c. (E)_____ Wet (marine diver, commercial fisherman, window washer, hand dishwasher, car washer, etc.)

3c. (E)_____ Humid: Excessive moisture content of the air which is not a result of weather conditions (Turkish bath attendant, laundry steam press operator, etc.)

4c. (E)_____ Dirty environment: Where the worker and/or his clothing typically become dirty, oily, greasy, etc. (coal mines, garages, foundries, earth working, tank cleaning, roughnecking, etc.)

5c. (E)_____ Improper illumination: Insufficient lighting, excessive brightness and glare (darkrooms, mines, airplane flying, welding, etc.)

6c. (E)_____ Vibration: Unpleasant vibration of all or part of the body (driving heavy equipment, tractors, and trucks; operating a pneumatic drill or air hammer; etc.)

7c. (E)_____ Uncomfortable body positions: Situations in which the worker is in prolonged cramped or confining positions (lying under a car; crawling under a house; nailing overhead; excessive bending, squatting, kneeling, etc.)

8c. (*)_____ Noise intensity: Indicate the average or typical noise level to which the worker is exposed.

0 - Soundproof rooms (recording studio, hearing examination room, room for testing audio equipment, etc.)

1 - Very quiet (lookout towers, greenhouses, underwater, darkrooms, etc.)

2 - Quiet (libraries, many private business offices, average residence, hospitals, etc.)

3 - Moderate (average traffic, offices where typewriters and business machines are used, beauty shop, etc.)

4 - Loud (heavy traffic, subways, many manufacturing plants and factories, woodworking shops, auto body shops, etc.)

5 - Very loud (jet engines, heavy earth-working equipment, large riveters, automatic punch presses, multiple sand blast units, etc.)

9c. (E)_____ Unpleasant weather conditions: The extent to which the worker is exposed to weather conditions such as high wind, rain, sleet, snow, extreme temperatures, etc. (These conditions are likely to be found in such occupations as telephone and power company linemen, postman, roustabout on an oil-drilling crew, etc.)

Temperature: Do not consider temperature conditions that are simply a function of the weather; think only of those conditions which are associated with this job regardless of the natural weather conditions.

10c. (E)_____ High temperature: Conditions in which the worker is exposed to temperatures sufficiently high to cause bodily discomfort (being in boiler rooms; near furnaces, cooking vats, forests fires, drying rooms; etc.)

11c. (E)_____ Low temperature: Conditions in which the worker is exposed to temperatures sufficiently low to cause bodily discomfort, even when clothing appropriate to the situation is worn (refrigerated rooms, high altitudes, etc.)

12c. (E)_____ Sudden temperature changes: The extent to which the worker typically experiences sudden changes in temperature that are sufficiently marked and abrupt to cause bodily discomfort (going in and out of refrigerated rooms or Turkish baths; going toward and away from furnaces, cooking vats, or fires; etc.)

Hazards: Indicate the extent to which the individual is exposed to the possibility of serious bodily injury or a definite danger to health from the following hazards:

13c. (E)_____ Mechanical hazards (power saw operator, lathe operator, punch press operator, rotary driller helper, meat grinder, etc.)

14c. (E)_____ Moving or falling objects (traffic director, heavy construction worker, house wrecker, miner, etc.)

15c. (E)_____ High places (window washer, aerialist, rig builder, painter, etc.)

16c. (E)_____ Exposure to burns (fireman, welder, tar kettleman, cook, etc.)

17c. (E)_____ Electrical hazards (power lineman, transformer maintenance man, electrician, etc.)

18c. (E)_____ Toxic conditions: Exposure to toxic dust, fumes, gases, vapors, mists, or liquids which cause general or localized disabling conditions as a result of inhalation or action on the skin (grain stacker, garbage sorter, quartz grinder, paint sprayer, ammonia-still operator, lead kettleman, etc.)

19c. (E)_____ Other hazards (explosives, radiant energy, high speeds, underwater, etc.)

20c. (E)_____ Overall hazard of the job (indicate the extent to which a serious injury or illness is likely to occur to the typical worker on this job from all job-related sources)

Apparel: Indicate which of the following types of attire are applicable to incumbents in this job. Use the following scale: 0 - does not apply; 1 - does apply. (More than one apparel type may apply to a job.)

21c. (A)_____ Safety apparel: Articles frequently worn by the worker on the job (safety hats or helmets, safety shoes, goggles, protective clothing, insulated gloves, etc.)

22c. (A)_____ Work clothes: "Blue collar" clothing, such as khakis, overalls, dungarees, etc. (as worn by construction workers, house painters, laborers, mechanics, factory workers, mine workers, etc.)

23c. (A)_____ Casual apparel (sportswear, etc.)

24c. (A)_____ Uniform (airline pilot, nurse, policeman, bellboy, postman, etc.)

25c. (A)_____ Business attire (coat and tie; dresses appropriate for offices, stores; etc.)

JOB STRUCTURE

The following items deal with the extent to which the incumbent's activities and schedule are restricted or prescribed by the nature of the job.

Job Structure: Indicate the extent to which the following aspects of the incumbent's performance are prescribed or restricted.

26c. (E)_____ Work procedures: Prescribed methods used in the performance of tasks, including the choice of materials, people, or elements which make up the tasks.

27c. (E)_____ Timing and sequence: Restrictions on when a task may be done and the ordering of the tasks which make up the job.

28c. (E)_____ Speed: Prescribed or restricted rate of speed or pace at which the task must be done.

29c. (E)_____ Performance standards: Prescribed quality of performance or output.

30c. (E)_____ Goals: Restriction in the choice of what is to be accomplished (an example of a job restricted to a very great extent is an assembly-line worker; an example of a job with very few restrictions is a fiction writer)

31c. (*)_____ Task diversity: How varied are the activities of the worker?

0 - Performs the same task repeatedly (assembly-line worker, elevator operator, etc.)

1 - Performs very few different tasks (file clerk, night watchman, garbage collector, etc.)

2 - Performs few different tasks (receptionist, department store clerk, mail carrier, etc.)

3 - Performs several different tasks (secretary, electrician, construction worker, patrolman, auto mechanic, etc.)

4 - Performs many different tasks (secondary school teacher, interior decorator, college professor, etc.)

5 - Seldom performs the same task twice (sculptor, artist, writer, etc.)

Work Schedule: The following items deal with various aspects of work schedules. Use the following scale: 0 - does not apply; 1 - does apply.

Regularity of Schedule (yearly basis)

32c. (A)_____ Steady work: Does not vary (office work, teaching, etc.)

33c. (A)_____ Seasonal work (farming, fruit picking and processing, etc.)

34c. (A)_____ Irregular work: Depends upon production demands, weather, etc. (construction work, etc.)

Consistency of Work Schedule (daily basis)

35c. (A)_____ Consistent schedule: Incumbent works approximately the same hours every day

36c. (A)_____ Changing shift work: Work hours vary from day to day or week to week according to a systematic plan (for example, two weeks of day hours alternating with two weeks of night or evening hours)

37c. (A)_____ Variable hours: Incumbent's hours vary from day to day or week to week, but not according to a systematic plan (insurance salesman, clergyman, etc.)

Day-Night Hours

38c. (A)_____ Day hours: Typically works between 7 a.m. and 6 p.m.

39c. (A)_____ Night hours: Typically works between 6 p.m. and 7 a.m.

40c. (A)_____ Variable day-night hours: Works both day and night shifts, or shifts that include both day and night hours (for example, evening shift--3 p.m. to 11 p.m.)

MISCELLANEOUS CONDITIONS AND REQUIREMENTS

Various work conditions and responsibility requirements.

Miscellaneous Work Conditions: Indicate the extent to which the incumbent is exposed to the following conditions.

41c. (E)_____ Distractions or interruptions: From other workers, superiors, customers, telephone calls, emergency signals, etc.

42c. (E)_____ Novel situations: New or unfamiliar situations for which incumbent has had no specific training, preparation, or instructions

43c. (E)_____ Confinement to a specified work space: Confinement may be due to the nature of the work or to rules and regulations

44c. (E)_____ Rush situations (rush jobs; emergencies; pressing deadlines; busy periods in grocery stores, restaurants, or service stations; etc.)

45c. (E)_____ Time away from home: Extent to which the worker is required by his job to be away from home beyond ten hours per day

46c. (E)_____ Updating knowledges, techniques, and skills: Extent to which the worker is expected to keep abreast of recent developments related to the job

Consequences of Errors: Ratings in this group of items should reflect consequences stemming from the most serious errors which could reasonably be expected in the performance of the job. Errors occur through neglect, inattention, faulty decisions, etc., as well as the inability to cope with the job.

47c. (*)_____ Financial or material consequences of errors: Consider the amount of damage to the financial and material assets of an organization which could reasonably be expected to result from an error on the part of the incumbent.

0 - Less than $25

1 - Between $25 and $100

2 - Between $100 and $500

3 - Between $500 and $2,000

4 - Between $2,000 and $10,000

5 - More than $10,000

48c. (*)_____ Safety consequences of errors: Consider the likelihood that any person (including the incumbent) would be physically harmed as a result of errors on the part of the incumbent.

0 - Negligible (typist, censor, art teacher, etc.)

1 - Very slight (waitress, janitor, etc.)

2 - Slight (cook, pet shop attendant, etc.)

3 - Moderate (optometrist, athletic coach, chemical laboratory technician, etc.)

4 - High (bus driver, registered nurse, crane operator, wild animal tamer, etc.)

5 - Very high (explosives operator, race car driver, flight instructor, etc.)

49c. (*)_____ Intangible consequences of errors: Consider the likelihood that errors on the part of the incumbent would inflict damage upon the organization in ways other than direct material loss or physical injury; for example, damage to the reputation, loss of clientele, damage to human relations within the organization, etc.

0 - Negligible (watchman, farm laborer, etc.)

1 - Very slight (janitor, elevator operator, etc.)

2 - Slight (secretary, key punch operator, information operator, etc.)

3 - Moderate (high school teacher, plumber, airline stewardess, etc.)

4 - High (maitre d', press secretary, hotel manager, etc.)

5 - Very high (corporation president, television personality, etc.)

50c. (*)_____ Organizational responsibility: Extent to which the incumbent is held accountable for decisions concerning organizational goals and procedures, the activities of others in the organization, the delegation of authority, etc. (Do not consider direct responsibility for safety or financial and material assets.)

0 - Not applicable (produce packer, mail clerk, newspaper carrier, etc.)

1 - To a very small extent (salesman, hotel desk clerk, receptionist, etc.)

2 - To a limited extent (head waiter, bell captain, supervisor of secretarial pool, etc.)

3 - To a moderate extent (construction foreman, service manager, sales manager, etc.)

4 - To a considerable extent (newspaper editor, department store manager, university dean, etc.)

5 - To a very great extent (chairman, board of directors, college president, corporation president, etc.)

SOCIAL CONTEXT

This category of items deals with various situations which comprise the social environment in which the incumbent works. Consider for each item whether or not the situation described is a part of the job. Then rate the item on the extent to which it is a part of the job being rated.

Personal Contact

51c. (E)_____ Working alone with little or no opportunity for social interaction (watchman, long distance truck driver, lighthouse keeper, etc.)

52c. (E)_____ Working individually in the presence of co-workers or others where social interaction is possible (secretary, receptionist, assembly-line worker, etc.)

53c. (E)_____ Working jointly with others as part of a team where social interaction and co-operation are necessary (member of survey team, member of aircraft crew, operating room nurse, etc.)

54c. (E)_____ Working individually in a one-to-one relationship with a customer, client, student, etc., where social interaction is restricted primarily to that person (barber with a customer, physician with a patient, counselor with a client, teacher advising a student, etc.)

Conflict Situations

55c. (E)_____ Conflicting job demands: Condition in which the incumbent is caught between two conflicting sets of expectations (traveling salesman who must leave his family often to perform his job, politician who must represent conflicting points of view in his constituency, minister who must uphold religious doctrine but must also solicit funds from church members, etc.)

56c. (E)_____ Moral value conflict: Condition in which job demands may conflict with commonly held social or cultural values (scientist involved in the development and testing of napalm, advertising executive developing ads for cigarettes, executioner, etc.)

57c. (E)_____ Interpersonal conflict: Situation in which incumbent's job goals conflict with the goals of those with whom he must deal (salesman bargaining with a customer over the price of a product, policeman arresting an offender, labor union leader negotiating a new contract with management, etc.)

58c. (E)_____ Unpleasant social relationships: Dealing with individuals in trying or strained situations (handling customer complaints, arbitrating differences between two parties, traffic policeman investigating an automobile accident, funeral director dealing with bereaved families, etc.)

Social Obligations

59c. (E)_____ Civic obligations: Required participation in community activities

60c. (E)_____ Social obligations: Required participation in social activities and events at times other than normal work hours

INCENTIVES

This category of items deals with various factors--either inherent in the job, associated with being in the job, or externally provided for performance in the job--which a worker may associate with satisfaction or reward and strive to attain. Indicate the extent to which this job provides each of the following incentives.

Existence: Incentives which relate to the incumbent's security, physical well being, and satisfaction.

61c. (E)_____ Job security: Assurance that one's job or income is steady and does not depend upon seasonal fluctuations, fluctuations in the economic situation, etc.

62c. (E)_____ Physical working conditions: Overall acceptability or pleasantness of the physical working conditions, including such factors as freedom from hazards, comfortable temperature, proper illumination, low noise level, attractive surroundings, etc.

63c. (E)_____ Job structure: Predictable and orderly job activities, free from unusual or ambiguous situations

64c. (*)_____ Compensation: Indicate the level which best describes the monetary compensation received from this job

0 - Much below average (domestic worker, farm laborer, nurse's aide, etc.)

1 - Below average (file clerk, department store sales clerk, short-order waitress, etc.)

2 - Slightly below average (policeman, secretary, fireman, draftsman, etc.)

3 - Slightly above average (plumber, machinist, auto salesman, computer programmer, etc.)

4 - Above average (architect, professional engineer, research scientist, etc.)

5 - Much above average (surgeon, corporation president, orthodonist, etc.)

Relatedness: Incentives which pertain to or affect interpersonal relations with others.

65c. (E)_____ Chance to help others: Opportunity to work with people to improve their well being; opportunity to do things for others

66c. (E)_____ Social relationships: Opportunity to establish and maintain rewarding social relationships with other persons or groups in the work situation

67c. (E)_____ Inside recognition: Opportunity to have one's work accomplishments singled out or acknowledged within his work organization

68c. (E)_____ Outside recognition: Opportunity to have one's work singled out or acknowledged outside the work organization (by the community, by professional organizations, etc.)

69c. (E)_____ Prestige: Status or standing accorded incumbent by virtue of his occupying this job position (Examples of jobs that are high in prestige include: physician, lawyer, college professor, minister, etc.)

Achievement and Self-Esteem: Incentives resulting from work accomplishments which affect one's self-image.

70c. (E)_____ Authority: Opportunity to direct or control the activities of others by virtue of one's position

71c. (E)_____ Advancement: Opportunity for promotion or other form of advancement as a result of accomplishments in the present position

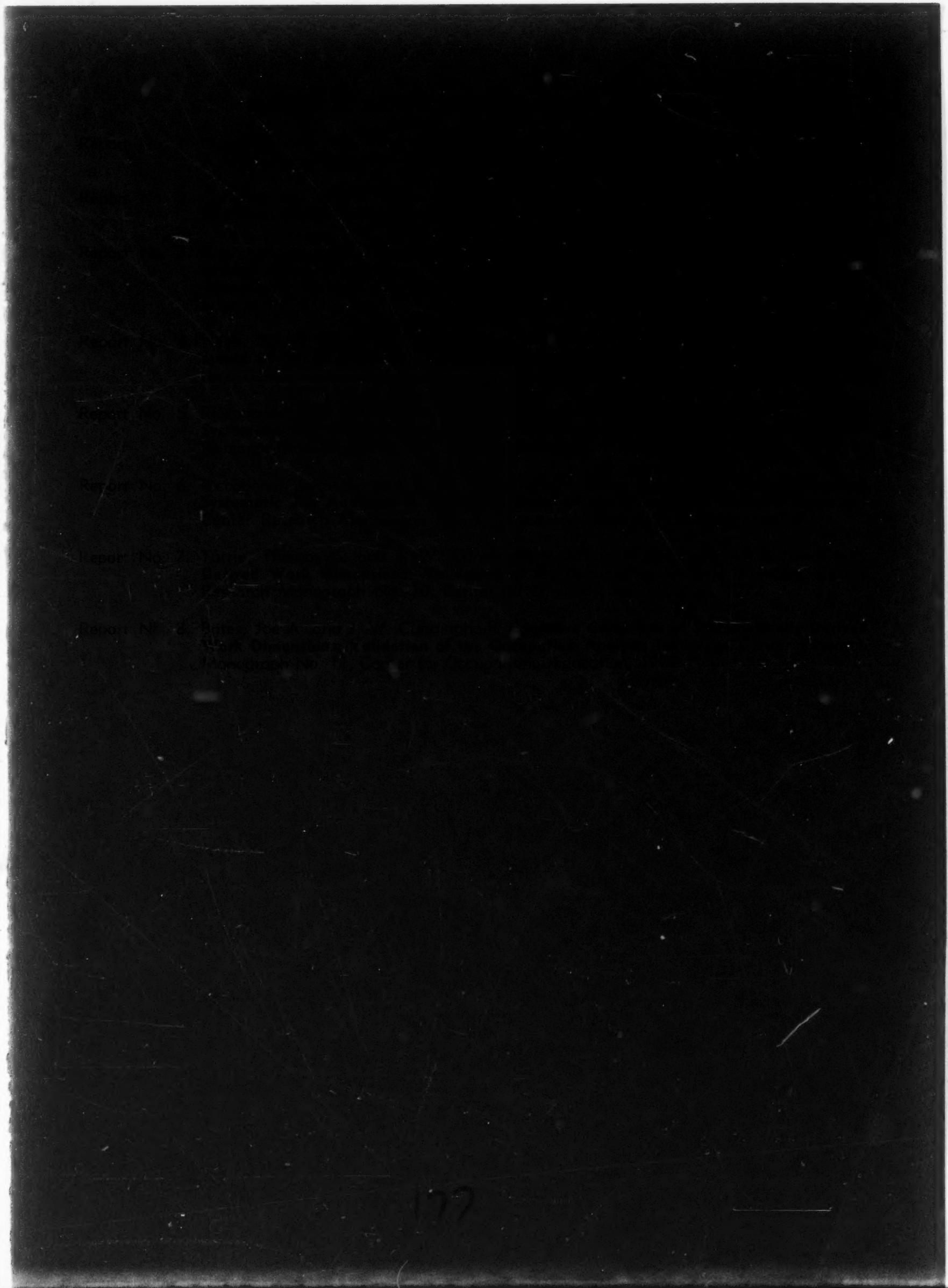
72c. (E)_____ Job performance information: Opportunity for the incumbent to receive frequent information concerning the adequacy of his performance. (This evaluation may be based on the incumbent's own observation or on information from other persons.)

73c. (E)_____ Responsibility: Opportunity to exercise one's own judgment, to make decisions, and to be accountable for the effects of one's decisions

Self-Actualization: Incentives relating to the opportunity for the incumbent to grow in the job and become what he is capable of becoming in terms of occupational potential.

74c. (E)_____ Creativity: Opportunity to apply one's initiative, ingenuity, and creativity to a work situation; opportunity to produce new and original products and ideas; to apply one's own ideas. (Examples of occupations providing opportunity for creativity include: school teacher, artist, research scientist, beauty operator, etc.)

75c. (E)_____ Utilization of abilities: Opportunity to participate in activities which make full use of one's abilities; work that is challenging in terms of skill, knowledge, or mental ability. (In rating the job, think in terms of the abilities of the "average" person.)

76c. (E)_____ Independence: Opportunity to plan and direct one's own activities rather than be directed by others; to be free of supervision

77c. (E)_____ Personal development: Opportunity for personal growth and development; opportunity to develop one's occupational skills and knowledges in order to reach one's full occupational potential. (In rating the job, think in terms of the developmental potential of the "average" person.)